



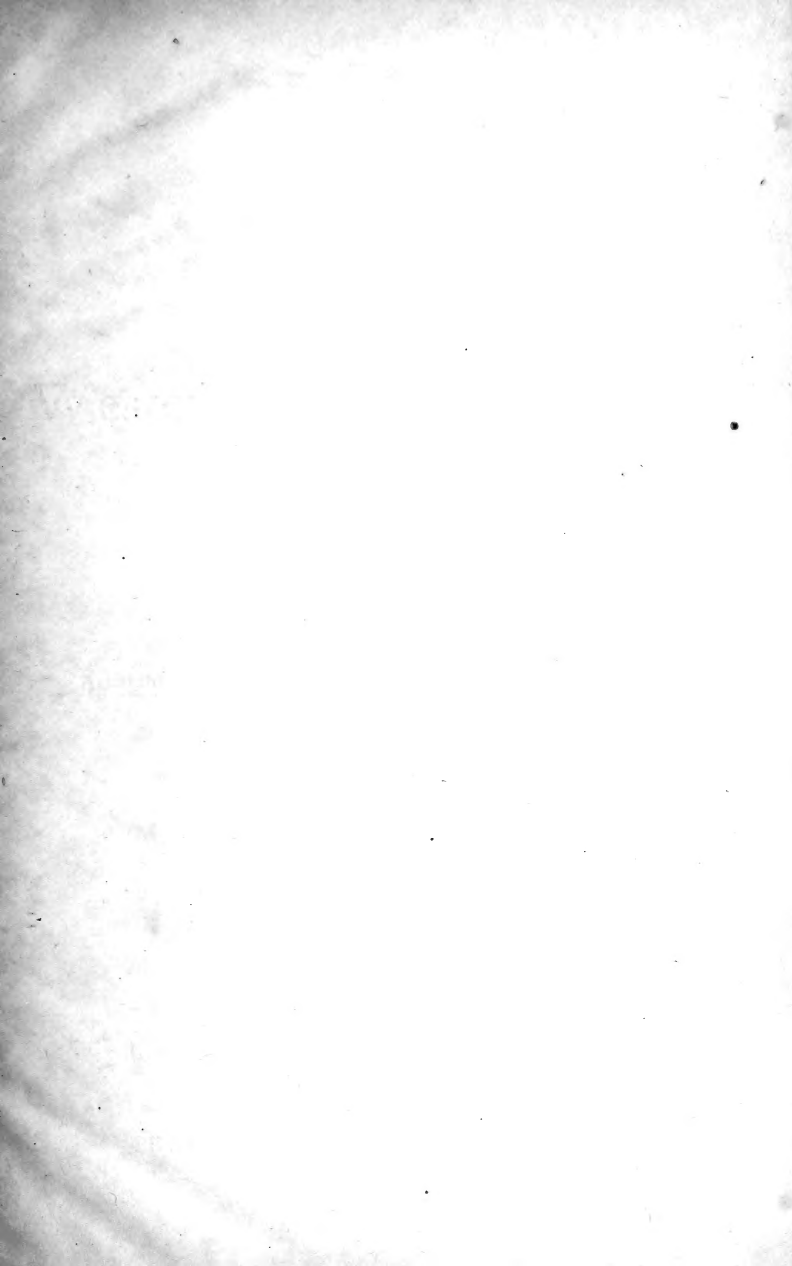
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A
FLORA
OF
Western Middle California

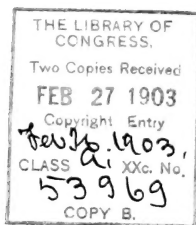
BY

WILLIS LINN JEPSON, PH.D.

Assistant Professor of Botany in the University of California

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HISTORICAL NOTE.

From 1789 to 1876 the botanical literature relating to California was confined chiefly to the descriptions of new species or annotated catalogues of collections made by various expeditions or by local collectors.

The first systematic treatise upon the plants of California was presented in the Botany of California, the first volume of which appeared in 1876, the second being published four years later. In these two volumes we have the first general account of the California flora. The work was based primarily upon a study of the plant collections of the California Geological Survey made by W. H. Brewer from 1860 to 1865 and later by H. N. Bolander, and also upon the rather considerable collections of the Pacific Railroad Surveys from 1851 to 1857. This material was supplemented by collections, some small, some considerable, made by resident collectors. The manuscript of the Polypetalæ was produced by the combined labors of W. H. Brewer and Sereno Watson; the Gamopetalæ were done by Asa Gray, while the second volume from the Apetalæ to the Cryptogams was elaborated by Watson with the assistance of specialists in various groups.

The two volumes made a pretentious work. As we are now able to perceive, there were many omissions, there were errors of judgment, and little is suggested of the amount of variation which is prevalent in so many Californian genera and species. But if one note the exceedingly inadequate material at the disposal of these authors, oft-times extremely meager, then we may well wonder that the work was so capably done, that it has stood so well the test of two decades of constant use. At this time our judgment is qualified by experience with its merits and demerits, and it is a secure judgment that although progression has left the Botany of California behind, it will always occupy the position of a classic.

In 1878 and in 1884 Asa Gray gave to the botanical world two parts of the Synoptical Flora of North America, in which were, of course, very considerable additions to the knowledge of the Californian flora. This work, so widely used, still remains as the only general revision of the North American Gamopetalæ.

From 1885 to 1895 the most active contributor to Californian botanical literature was E. L. Greene. His papers upon plant

nomenclature have, doubtless, made him most widely known, since in America no other writer has so pronounced and extreme views upon this subject. Nearly all of his many writings, whatever the title or topic, are colored by the ideas of nomenclature which have brought him into prominence. The particular contributions which are most available to the Californian student are the *Flora Franciscana*, still incomplete, and the *Manual of Botany of the Region of San Francisco Bay*, in both of which his principles of nomenclature are exemplified. He has what is termed a keen eye for specific differences, has published a very large number of new species, and is the author of larger number of new names and new combinations than any other American botanist or zoologist. He has also an appreciation of natural relationships which has led him to propose new arrangements for many genera and species. It should be added that many of these changes have found wide acceptance.

During this long period there have been many other resident workers on the flora of western middle California. Of these mention should be made of Dr. Albert Kellogg, one of the founders of the California Academy of Sciences; Dr. Hermann H. Behr, author of a *Flora of the Vicinity of San Francisco*; Mrs. Katherine Brandeggee, formerly Mrs. Curran, who has studied very thoroughly the local flora for many years and published revisions of genera and of species; Mr. Volney Rattan, Miss Alice Eastwood, and many others whose names find mention in the following pages.

PREFATORY NOTE.

The present volume embodies the results of a prolonged and studious examination into the flora of western middle California. It is, in brief, an attempt to present in book form an account of the seed plants of the region by descriptions of the living plants—of the plants as they actually exist. It is as little as may be at the present time a revision of what has been written about plants of the region, or of plants or of species ascribed to it. The author has enlarged his laboratory and herbarium experience by innumerable excursions and expeditions into the cañons and mountains, through the valleys and along the water-courses of California. The diagnoses have been derived mainly from fresh specimens collected by the author or by his colleagues in the Department of Botany, and from similar abundant material supplied by many helpful correspondents resident in various parts of the state.

As to the recognition of species, that is the determination of the number of species present in our region and the working out of their relationships, field studies played an important part. In the larger or more variable genera resort was had to the following method: The material of a given genus was segregated into a certain number of forms (regarded as distinct) or varieties of these forms, the judgment passed being in large measure controlled by field studies. The descriptions of such forms were drawn up from fresh material or herbarium material. The results of these studies could not in all cases, however, be correlated with the existing literature, but to the descriptions such names were applied as were available in the literature and with all care and caution. Therefore, a particular description stands for a natural type (that is to say the usual or dominating or most marked form), while the name may belong to a form of the species which is unusual or abnormal, or may, indeed, belong to a very different plant since the original description by which such a name was published may be so vague, so loose, or so broad that exact determination is difficult or impossible. Difficulties of this nature may only be settled by a study of the original or type specimens, but these are, to us, largely inaccessible. Moreover, type specimens are not infrequently so poor or so fragmentary that nothing can be made of them. It should be understood, therefore, that the author's conception of the species here given place is expressed by the descriptions rather than by the names; that there is here an account of the plants of the region rather than a list of species gleaned from the literature.

One other course was open. Instead of presenting a fresh account of the plants known to us as occurring in our region it would have been quite possible to list the species attributed to middle California and copy the paraphrased descriptions which we have inherited, adding more or less new matter and emending where it seemed necessary. To one, however, whose facilities as to type-specimens are limited but whose advantages as to the study of the living flora are in

many ways unlimited, surely there could be but one choice as to **what** his task should be.

Nevertheless, it is not in the least the intention to deny to the literature a debt which is plain, but the obligation to some of the more recent "systematic" literature must be said to be dubious when one remembers the paucity of monographic work and contrasts the long list of "new species." It is not too much to say that a considerable proportion of these "new species" consists of isolated descriptions, that there is a lack of coordination with species already known, and that as to many of them even their nearest relatives are not acknowledged. It has not been possible to investigate all such. Some are obviously to be rejected—in any event they have not been included here by merit of publication merely. Many others, on the contrary, it has been possible to study more or less fully; of these a surprising number reveal most excellent characters which are not in the least suggested in their often unsatisfactory diagnoses.

Supplementing the account of structures the student will find numerous records of physiological peculiarities of various species, details of habit or of aspect—features which lure the eye of the expert in the field but which are obscured or lost in the dried specimen. Observations of this character have been eagerly sought, as well as notes concerning associated species, modes of vegetative reproduction, behavior in the dry season and similar data.

Another well defined aim has been held constantly in view as the work progressed. It was deemed to be in the highest degree desirable, on account of the very interesting and instructive variation which exists among Californian plants, that the flora should, in so far as possible, reflect something of this phenomenon. In many cases, indeed whenever opportunity offered, detailed accounts of marked variations have been recorded in the field. Distinctions between variable and invariable types have been rendered far easier of analysis and made in a great degree more certain by a close study of fresh material, which has not infrequently been available in large quantity. Variation ascribable to difference in soil, exposure, dryness and so on is often noted and varieties are here described which may properly be called ecological varieties.

A very great amount of time and effort has been expended upon the construction of keys; a general key to the families, keys to the genera under the families, keys to the species under the genera, and in some cases even keys to the varieties. The key to the families is a wholly artificial key; it is not intended in the least to indicate natural relationships, but simply to guide the student, by a path as direct and as sure as possible, to the family. Hence no exceptions are allowed. Since there are, of course, exceptions in a great many families, genera or even species of the same family may be divided in the key. Moreover, the keys apply only to the species listed. While the specific keys have been carefully made, nevertheless, this is the first descriptive flora in Western America to present such keys and the student should use them to secure a

suggestion of the species, controlling his final decision by a rigid comparison with all the terms of the diagnosis.

The beginner should never forget that the same species may be of quite different appearance in different localities. Soil, exposure, altitude, humidity, distance from the ocean, influence very greatly the habit and aspect of the plant. Vegetative characters (that is characters of the root, stem, foliage, size of the plant or of its various parts, amount of pubescence) vary endlessly in many plants. Hence it is well to rely chiefly upon the reproductive characters, that is characters of the reproductive organs, namely the flower and the fruit, rather than upon merely vegetative characters.

The variation of the plant from its normal appearance may often be correlated with its situation, at least as to the vegetative features. The following classes of localities may be noted under this head:—

1. Near the ocean a species is often more depressed or condensed than in the interior, and more fleshy.
2. In swamps or wet soils the plant tends to become succulent and of ranker growth, and also glabrous.
3. In valley soils the growth is commonly much more rank than elsewhere.
4. On hilltops plants tend to become dwarf and acaulescent; often far more pubescent also.
5. In saline or subsaline soil the stems and foliage in many species are far more vigorous and the flowers larger than on stiff clays or adobes.
6. In shady woods leaves become thinner and larger, often conspicuously so.
7. At high altitudes the flowers are larger in proportion to stature and brighter in color.

In the matter of terminology the number of terms here employed has been considerably reduced. The term bract (as an example) has been applied to all bracteal organs and special designations have not been applied to modifications of bracts peculiar to certain families.

Local common names have been sedulously noted in all parts of the state and such as were appropriate will be found appended to the proper species. The coining of so-called common names from the Latin binomial has been avoided and we have also seen fit to reject common names of Old World and Eastern species which have been applied to different plants in California.

By Western Middle California is meant that portion of California lying west of the Sacramento and San Joaquin Rivers, south of the counties of Mendocino, Lake and Colusa and north of the Pajaro River and Pacheco Pass. Very many extra-limital species are described or noticed, however, so that the volume will be almost if not quite as useful as far north as Red Bluff and as far south as Bakersfield.

The author now has opportunity to make acknowledgments for services rendered by his colleagues and correspondents. Prof. W. A. Setchell has, by his unflinching encouragement and constant advice,

promoted very materially the progress of this work; he has, moreover, collected several hundred phænogamic plants of pronounced value, expressly for the author's use. Mr. J. B. Davy has provided a competent and much needed revision of the grasses for which the author is especially grateful; he has also furnished several thousand specimens, many of which were accompanied by field notes. For the privileges of a research student at the Gray Herbarium of Harvard University cordial thanks are returned to Prof. B. L. Robinson. Frequent use has been made of the Herbarium of the California Academy of Sciences and kindly acknowledgments are due to its curator, Miss Alice Eastwood. For contributions of valuable specimens it is a pleasure to name Mr. S. B. Parish of San Bernardino, Mr. R. H. Platt of Vacaville, Mr. M. S. Baker of the Sacramento High School, Mr. P. S. Woolsey of the Visalia High School, Mr. J. H. Barber of Paso Robles, and Mr. H. M. Hall, Mr. H. P. Chandler, and Mr. J. P. Tracy, students of the University of California. Finally there is to be mentioned the valuable assistance in proof-reading given by Mr. P. E. Goddard, Mrs. E. J. C. Gilbert and Miss K. D. Jones.

Many a valley and mountain peak of California, numerous chaparral slopes and leagues wide plains have not to this day been explored botanically. There must yet be numerous additions to the knowledge of our flora before such knowledge can be considered in anywise complete. Emendations and notes of omission will, therefore, be most gratefully received.

WILLIS LINN JEPSON.

Mt. Whitney Trail,
Aug. 6, 1900.

KEY TO THE SEED PLANTS OF WESTERN MIDDLE CALIFORNIA

GYMNOSPERMÆ.

Ovules borne naked on a scale; cotyledons 3 to 15, sometimes 2; flowers monœcious or diœcious; leaves needle-like, scale-like or linear; trees or shrubs, ours evergreen.

Flowers solitary; ovule 1 to each cup-shaped disk or fleshy envelope, becoming a bony seed TAXACEÆ, p. 17.

Flowers in cone-like aments, the pistillate ament becoming a scaly cone, rarely a berry; ovules 2 or more at the base of each scale.

CONIFERÆ, p. 18.

ANGIOSPERMÆ.

Ovules borne in a closed sac or ovary, which becomes the fruit; cotyledons 1 or 2.

CLASS 1.—MONOCOTYLEDONS.

Leaves with parallel veins (except *Trillium*); parts of the flowers usually in 3's, never in 4's or 5's; vascular bundles scattered irregularly through the pithy tissue, not in rings or annual layers; embryo with 1 cotyledon; all ours herbs, when perennial mostly with rootstocks or bulbs.

A. Flowers without perianth and enveloped by chaffy bracts, or the perianth dry and scarious.

Flowers (in ours) sessile, in dense spikelets, with imbricate bractlets; spikelets borne in spikes, racemes, panicles or umbels; perianth none or reduced to bristles; fruit an achene.

Stems mostly terete and hollow; leaves in 2 rows; sheaths mostly split open opposite the blade; ligule mostly conspicuous; bractlets 2 subtending each flower, or the upper (the palea) rarely obsolete; anthers mostly versatile; seed (in ours) adnate to the pericarp GRAMINEÆ, p. 26.

Stems mostly triangular, solid; leaves in 3 rows; sheaths entire; ligule obsolete or minute; bractlet only 1 subtending each flower; anthers erect; seed free from the pericarp.

CYPERACEÆ, p. 83.

- Flowers (in ours) pedicellate, in paniculate clusters, or sessile in dense capitate heads; perianth of 6 distinct dry segments; leaves terete or flat; fruit a capsule. . . JUNCACEÆ, p. 92.
- B.** Flowers on a spadix or spike, the whole cluster often enclosed by a spathe or foliaceous or membranaceous bract; perianth none or not petal-like.
- Subaquatic reed-like plants; flowers unisexual, borne in a dense cylindrical spike or globose head, without distinct perianth . . . TYPHACEÆ, p. 95.
- Small or minute leafless aquatics, the stems represented by leaf-like floating fronds . . . LEMNACEÆ, p. 97.
- Aquatic plants; flowers naked or with a very small calyx, perfect or unisexual; stamens 1 to 4 . . . NAIADACEÆ, p. 99.
- Marsh or subaquatic plants; flowers perfect, with or without perianth; stamens 6 or 1 . . . JUNCAGINACEÆ, p. 102.
- C.** Flowers with a more or less corolla-like perianth.
- Ovaries several, distinct, becoming achenes in fruit; perianth of 3 sepals and 3 petals. . . ALISMACEÆ, p. 104.
- Ovary 1 and
- Superior; perianth regular, petal-like; stamens 6, sometimes 3 or 4 . . . LILIACEÆ, p. 106.
- Inferior.
- Perianth regular; stamens 3. . . IRIDACEÆ, p. 128.
- Perianth irregular; stamens 1, rarely 2. ORCHIDACEÆ, p. 130.

CLASS 2.—DICOTYLEDONS.

Leaves netted-veined; parts of the flower mostly in 4's or 5's; vascular bundles in a ring around a central pith, the stem when perennial increasing in girth by annual layers; embryo with 2 cotyledons.

I. APETALOUS DIVISION. Corolla none; calyx present, sometimes petal-like, rarely none.

A. FLOWERS MONÆCIOUS OR DICEIOUS, ONE OR BOTH KINDS IN AMENTS; TREES OR SHRUBS.

Leaves simple and

Opposite; flower diæcious, 1 to 3 in each axil of the connate bracts; sepals of staminate flowers 4, of pistillate flower 2 or none . . .

GARRYACEÆ, p. 362.

Alternate.

Both kinds of flowers in aments.

Flowers 1 to each scale or bract; perianth none.

Fruit a 1-celled many-seeded capsule; seeds with a coma; flowers diæcious. . . SALICACEÆ, p. 135.

Fruit a waxy-coated berry; flowers monæcious or diæcious. MYRICACEÆ, p. 146.

Flowers 2 or 3 to each scale or bract; staminate ament long, pendulous; pistillate small, maturing into a woody cone containing margined achenes. . . BETULACEÆ, p. 139.

Only the staminate (rarely the pistillate) in aments.

Fruit a nut enclosed in a leafy tubular involucre.
CORYLACEÆ, p. 140.

Fruit a nut set in a scaly cup or bur (acorn or chestnut)
CUPULIFERÆ, p. 141.

Leaves pinnate; only the staminate flowers in aments; fruit a nut
with a fibrous coat. JUGLANDACEÆ, p. 145.

B. FLOWERS NOT IN AMENTS.

1. Trees, shrubs, or woody climbers.

Leaves opposite.

Flowers dioecious.

Ovary inferior; fruit a berry; leaves simple and foliaceous or
reduced to scales; parasitic on trees. LORANTHACEÆ, p. 365.

Ovary superior; leaves pinnate.

Stamens 4 or 5; fruit a double samara; var. of.
Acer Negundo, p. 252.

Stamens commonly 2; fruit a simple samara
Fraxinus Oregana, p. 385.

Flowers dioecious or polygamo-dioecious; sepals 4, petal-like; sta-
mens numerous; fruit a tailed achene; climbing plants
Clematis, p. 197.

Leaves alternate and simple.

Flowers monœcious, in head-like clusters scattered on a slender axis;
calyx none PLATANACEÆ, p. 274.

Flowers perfect or unisexual; sepals and stamens 4 or 5; fruit berry-
like Rhamnus, p. 253.

Flowers perfect.

Stamens 6 to numerous.

Erect trees or shrubs.

Calyx of 6 petal-like sepals; stamens 9, the anthers opening
by uplifted valves; fruit a drupe; evergreen.
LAURACEÆ, p. 191.

Calyx 5-lobed; stamens numerous, 25 to 60, inserted on the
calyx; fruit a tailed achene Cercocarpus, p. 277.

Calyx 4-cleft, corolla-like; low shrub with tough leathery
stems. THYMELEACEÆ, p. 259.

Climbing plant; calyx tubular; stamens 6, anthers sessile;
capsule 6-celled Aristolochia, p. 364.

Stamens 5, monadelphous; calyx 5-cleft; showy; capsule com-
monly 5-celled Fremontia, p. 236.

Stamens 1 or 2; calyx of 4 or 5 sepals; leaves much reduced and
scale-like Allenrolfea, p. 181.

2. Herbs.

* OVARY SUPERIOR, *i. e.*, FREE FROM THE CALYX.

Calyx present; corolla none.

Pistils more than 1 and distinct, becoming achenes; sepals com-
monly 5, distinct, often petal-like; stamens many

RANUNCULACEÆ, p. 193.

Pistils 1 or 2, distinct; calyx-tube armed with barbed prickles, its limb 3 to 7-parted; leaflets pinnatifid.

Acacia, p. 284.

Pistil 1, 1-celled; stigmas or styles often more than one.

Stipules present.

Leaves alternate; fruit an achene.

Stipules sheathing, scarious; calyx 5 to 6-cleft or -parted, or of distinct sepals, often petal-like; stamens 4 to 9; fruit a 3-sided or lenticular achene.

POLYGONACEÆ, p. 148.

Stipules not sheathing; calyx greenish; stamens 1 to 4.

Flowers monœcious, very small, in ament-like inflorescences; plants with stinging herbage

URTICACEÆ, p. 146.

Flowers perfect, fascicled; diminutive annual.

Alchemilla, p. 284.

Leaves opposite; small or prostrate herbs.

Calyx of 5 distinct sepals; stamens 3 to 5.

Fruit an achene or utricle; stipules scarious; genera nos. 12 to 14 of

CARYOPHYLLACEÆ, p. 163.

Fruit a 3-valved capsule; stipules setaceous.

Lœfflingia, p. 171.

Calyx 5-cleft; capsule circumscissile; stipules laciniate; stamens 1 to 3.

Cypselea, p. 189.

Stipules none.

Fruit an achene or utricle.

Leaves opposite or whorled.

Calyx tubular, corolla-like, the base of the tube hardening and enclosing the achene; prostrate maritime herbs

NYCTAGINACEÆ, p. 183.

Calyx of 6 (rarely 5) distinct often petal-like sepals; fruit a 3-sided or lenticular achene; leaves whorled or opposite

POLYGONACEÆ, p. 148.

Leaves alternate or opposite; calyx of 5 or fewer sepals.

Sepals herbaceous or, in unisexual flowers, the pistillate without calyx and enclosed by two bracts; bractlets none; mostly scurfy plants of alkaline or maritime habitat.

CHENOPODIACEÆ, p. 174.

Sepals membranous or scarious; flowers with bractlets

AMARANTACEÆ, p. 172.

Fruit a capsule; leaves opposite.

Stamens numerous; capsule circumscissile; calyx of 5 purple segments; perennial herb

Sesuvium, p. 189.

Stamens 5 or fewer; capsule opening by valves.

Calyx of 5 distinct sepals, white inside; prostrate annual

Mollugo, p. 188.

Calyx 5-lobed, the lobes petal-like; erect perennial herb, maritime or of salt marshes

Glauca, p. 374.

Calyx 4-parted; diminutive annual with filiform leaves. .
*Sagina apetal*a, p. 169.

Calyx and corolla both wanting; pistil 1.

Flowers perfect, borne in a spike, each flower subtended by a colored bract, the spike subtended by a conspicuous colored involucre; herb of saline habitat. *Anemopsis*, p. 162.

Flowers monœcious.

Terrestrial plants; flower-clusters often surrounded by a petal-like involucre resembling a perianth; stamens 1 to many; capsule 1 or commonly 3-celled; juice often milky. . . .
EUPHORBIACEÆ, p. 260.

Aquatic plants; leaves opposite; stamens 1.

Leaves dissected; ovary 1-celled, in fruit a spinose or tuberculate achene. *CERATOPHYLLACEÆ*, p. 191.

Leaves entire; ovary 4-celled, splitting when ripe into 4 parts.
CALLITRICHACEÆ, p. 263.

**** OVARY INFERIOR, *i. e.*, MORE OR LESS ADHERENT TO THE CALYX.**

Flowers diœcious or the pistillate with stamens; stamens many; capsule 1-celled; leaves alternate, divided.
DATISCAECÆ, p. 321.

Flowers perfect.

Leaves reniform or cordate; calyx-lobes 3, caudate; capsule 6-celled; nearly acaulescent perennial. . . . *Asarum*, p. 363.

Leaves not reniform or cordate.

Calyx-lobes 4.

Leaves alternate; fruit a 3 to 9-celled bony nut with herbaceous covering; succulent herb. . . *Tetragonia*, p. 189.

Leaves opposite; fruit a 4-celled capsule; stems creeping in mud or floating in water. . . *Ludwigia*, p. 326.

Calyx entire; stamens 1; fruit nut-like, 1-celled, 1-seeded; aquatics with simple entire leaves in whorls.
Hippuris, p. 338.

II. CHORIPETALOUS DIVISION. Calyx and corolla present, the latter of distinct petals.

A. OVARY SUPERIOR, *i. e.*, FREE FROM THE CALYX.

1. Stamens hypogynous, more than 10.

Pistils several to many.

Pistils simple and distinct.

Leaves not peltate.

Pistils becoming achenes or follicles.
RANUNCULACEÆ, p. 193.

Pistils at first united, later distinct as torulose pods.
Platystemon, p. 205.

Leaves peltate; aquatic plant. . . *Brasenia*, p. 192.

Pistils cohering in a ring around a central axis; stamens monadelphous. *MALVACEÆ*, p. 236.

Pistil 1 and

One-celled, the styles or stigmas often more than one.

Sepals caducous; petals 4 or 6, twice as many as the sepals . . .
 PAPAVRACEÆ, p. 205.

Sepals persistent or at least not caducous.

Acaulescent plants; petals 8 to 16; sepals 4 to 8
 Lewisia, p. 184.

Caulescent plants.

Petals 5; fruit a capsule; leaves simple, entire.

Sepals 2; styles 3 Calandrinia, p. 185.

Sepals 5, the 2 outer smaller and bract-like; style 1 . . .
 CISTACEÆ, p. 233.

Petals 1 or 2; sepals about 4; fruit a berry; leaves compound.
 Actæa, 202.

More than 1-celled.

Petals 5; sepals or calyx-lobes 5.

Stamens monadelphous, jointed to the base of the petals; sepals
 not distinct, valvate; leaves alternate.
 MALVACEÆ, p. 236.

Stamens disposed in 3 to 5 indistinct bunches; sepals distinct,
 imbricate; leaves opposite HYPERICACEÆ, p. 235.

Petals 10 to 20; sepals 5 to 12; aquatic herbs.
 Nuphar, p. 192.

2. Stamens hypogynous, 10 or fewer.

Pistils more than 1, distinct, and

Exceeding in number the sepals or petals
 RANUNCULACEÆ, p. 193.

Of the same number as the sepals or petals
 CRASSULACEÆ, p. 264.

Pistils more or less united around a central axis, elastically separating
 when ripe as 1-seeded carpels; petals 5
 GERANIACEÆ, p. 245.

Pistil 1, the styles or stigmas sometimes more than one.

Corolla irregular,

Papilionaceous; stamens 10, di- or mon-adelphous, rarely distinct;
 fruit a legume LEGUMINOSÆ, p. 288.

Petals 5, one with a spur; sepals 5, auricled; stamens 5; fruit a
 1-celled capsule VIOLACEÆ, p. 230.

Petals 4; stamens 6.

Sepals 4; fruit a silique; annual; some species of
 Streptanthus, p. 213.

Sepals 2; petals in 2 dissimilar pairs; perennial
 Dicentra, p. 209.

Petal 1; calyx 5-toothed; stamens 10; leaves pinnate; shrub . . .
 Amorpha, p. 293.

Corolla regular.

Ovary 1-celled.

Anthers opening by uplifted valves; petals 6, in whorls of 3;
 stamens 6; fruit a berry or capsule
 BERBERIDACEÆ, p. 203.

Anthers opening by longitudinal slits; herbs.

Fruit a capsule opening from the apex by valves or teeth; petals 5 or 4.

Calyx tubular or of 5 (or 4) distinct sepals; stamens 3 to 10, commonly 5 or 10; capsule 3 to 10-valved or -toothed; placenta central; styles 2 to 5

CARYOPHYLLACEÆ, p. 163.

Calyx of 2 distinct sepals; stamens 5 (or 3 to many); capsule 3-valved; placenta central or basal; styles 2 to 8

PORTULACACEÆ, p. 184.

Calyx tubular; stamens 4 to 7; capsule 2 to 4-valved; placenta parietal; style 3-cleft

FRANKENIACEÆ, p. 162.

Fruit indehiscent.

Style 1 or none; sepals and petals 4; stamens tetradynamous

CRUCIFERÆ, p. 210.

Styles, sepals, petals and stamens 5

PLUMBAGINACEÆ, p. 377.

Ovary more than 1-celled.

Anthers opening by pores at the summit; sepals and petals 5 or 4, the stamens as many or twice as many; capsule 5-celled

ERICACEÆ, p. 367.

Anthers opening by longitudinal slits.

Herbs.

Leaves alternate or basal.

Sepals and petals 4; stamens 6.

Ovary not stipitate; stamens commonly 4 long and 2 short (tetradynamous); sepals and petals 4; fruit a 2-celled capsule (silique or silicle)

CRUCIFERÆ, p. 210.

Ovary raised on a stipe; stamens not tetradynamous; leaves 3-foliolate

CAPPARIDACEÆ, p. 229.

Sepals and petals 5; fruit a 5-celled capsule.

Stamens 10, more or less united at base; leaves 3-foliolate

Oxalis, p. 245.

Stamens 5; leaves simple

LINACEÆ, p. 243.

Leaves opposite; annuals.

Calyx of 2 distinct sepals; flowers 2 to 5-merous; fruit a 2 to 5-celled capsule

ELATINACEÆ, p. 234.

Calyx tubular; stamens 10 and petals 5, the latter clawed; fruit an imperfectly 3-celled capsule . . .

Silene Gallica, p. 165.

Shrub; fruit a simple samara; stamens and petals 2 each; leaves opposite, pinnate

Fraxinus dipetala, p. 385.

3. Stamens perigynous, i. e., on the calyx or on a more or less evident disk.

Stamens on a hypogynous disk or on a disk lining the base of the calyx.

Trees or shrubs.

Stamens twice as many as the petals and alternate with them.

Leaves alternate, trifoliate.

Styles or stigmas 3; fruit drupe-like
ANACARDIACEÆ, p. 250.Style 1; fruit a 2-celled, 2-seeded samara
RUTACEÆ, p. 249.

Leaves opposite, simple; style 1 or none; fruit a 3 to 5-celled capsule; seeds with an aril. . CELASTRACEÆ, p. 252.

Stamens 4 or 5, as many as the petals and opposite them.

Shrubs; petals often hooded, commonly with claws; ovary commonly 3-celled, splitting when ripe into 3 one-seeded parts RHAMNACEÆ, p. 253.

Woody vine, climbing by tendrils; petals early deciduous, cohering by their tips; fruit a berry
VITACEÆ, p. 259.

Stamens 7 to 9; petals 5, equal; fruit a double samara; leaves simple. Acer macrophyllum, p. 252.

Stamens 5 to 8; petals 4 or 5, clawed, slightly irregular; fruit a 1-seeded capsule; leaves palmately compound
SAPINDACEÆ, p. 251.Herbs; stamens 8 to 30; petals 4 to 7, laciniate; disk 1-sided . . .
RESEDACEÆ, p. 230.

Stamens on the calyx.

Corolla regular.

Stipules present; pistils one to several, sometimes partly united to the disk; petals 5; stamens 10 to numerous; leaves alternate, often compound . . ROSACEÆ, p. 275.

Stipules none; leaves simple.

Pistils many, concealed in a hollow receptacle; leaves opposite, simple CALYCANTHACEÆ, p. 190.

Pistil 1; petals 5; stamens 5 or 10
SAXIFRAGACEÆ, p. 267.Pistil 1, becoming a capsule enclosed by, but free from, the tubular calyx; stamens 4 to 12; leaves simple, entire . .
LYTHRACEÆ, p. 323.

Corolla irregular, papilionaceous; stamens monadelphous, or diadelphous, rarely distinct; fruit a legume; leaves commonly compound LEGUMINOSÆ, p. 288.

B. OVARY INFERIOR, I. E., MORE OR LESS ADHERENT TO THE CALYX.

I. Trees and Shrubs.

Stamens more numerous than the petals; petals 5.

Leaves alternate; fruit a pome ROSACEÆ, p. 275.

Leaves opposite; fruit a capsule; trailing undershrub
Whipplea, p. 272.

Stamens as many as the petals and opposite them; petals 5, hooded; fruit 3-celled, 1 seed in each cell . . Ceanothus, p. 254.

Stamens as many as the petals and alternate with them.

Petals 4; style 1; flowers small, in cymes, or if in a head, surrounded by a conspicuous corolla-like involucre; fruit drupe-like; leaves opposite CORNACEÆ, p. 360.

Petals (in ours) 5; styles 2, more or less distinct; flowers in racemes or solitary; fruit a smooth or prickly berry; leaves alternate. Ribes, p. 272.

2. Herbs.

Petals and stamens numerous; fruit 10 to 12-celled, dehiscent at summit; succulent maritime herb . Mesembryanthemum, p. 190.

Petals 5 or fewer.

Styles 4 or 5; flowers in paniced umbels; fruit berry-like ARAIACEÆ, p. 339.

Styles 2; flowers in simple or compound umbels, sometimes capitate; fruit splitting into 2 one-seeded carpels UMBELLIFERÆ, p. 340.

Style 1.

Sepals and petals 4 (rarely 5 or 2), the stamens commonly twice as many; fruit commonly a 4-celled capsule ONAGRACEÆ, p. 325.

Sepals and petals 5; stamens numerous; fruit a 1-celled capsule opening at the top; rough-hairy herbs LOASACEÆ, p. 321.

Sepals 2; petals 5; stamens 7 to 20; style mostly 3 to 8-parted; fleshy herb Portulaca, p. 184.

Style none; stigmas 4; leaves in whorls; aquatic plants HALORAGEÆ, p. 338.

III. SYMPETALOUS DIVISION. Calyx and corolla both present, the latter with the petals united, at least at base.

A. STAMENS MORE THAN 5.

Anthers opening by a hole at the top; stamens 8 or 10; ovary superior or inferior; leaves simple; trees, shrubs or parasitic plants ERICACEÆ, p. 367.

Anthers opening by longitudinal slits; ovary superior.

Petals 5.

Pistils 4 or 5, distinct; stamens 10 CRASSULACEÆ, p. 264.

Pistil 1.

Stamens 10, di- or mon-adelphous, rarely distinct.

Flowers papilionaceous; ovary 1-celled; style 1, entire; leaves compound (except Cercis) LEGUMINOSÆ, p. 288.

Flowers regular; ovary 5-celled; style 5-lobed; leaves 3-foliate Oxalis, p. 245.

Stamens indefinite, monadelphous; ovary 5 to many-celled, either splitting into as many carpels when ripe or capsular. MALVACEÆ, p. 236.

Petals less than 5.

Leaves entire; petals 3; sepals 5, 2 petal-like; stamens 6 to 8; ovary 2-celled; flower imitating the papilionaceous

POLYGALACEÆ, p. 248.

Leaves divided; petals 4 in two dissimilar pairs; sepals 2; stamens 6

Dicentra formosa, p. 210.

B. STAMENS 5 OR LESS.

1. Ovary superior, i. e., free from the calyx.

Corolla regular.

Stamens free from the corolla; ovary several-celled; shrubs

ERICACEÆ, p. 367.

Stamens adnate to the corolla.

Pistil 1.

Stamens as many as the lobes of the corolla and opposite them.

Style 1; fruit a capsule . . . PRIMULACEÆ, p. 374.

Styles 5; fruit a utricle or achene

PLUMBAGINACEÆ, p. 377.

Stamens as many as or fewer than the lobes of the corolla and alternate with its lobes; fruit a capsule (or in *Solanum* a berry).

Ovary 1 or 2-celled.

Styles 2, more or less distinct; flowers 5-merous; ovary 1 or 2-celled; leaves mostly alternate, usually toothed, lobed or compound . . . HYDROPHYLLACEÆ, p. 432.

Style 1 or none.

Ovary and capsule 1-celled; flowers 4 or 5-merous; leaves simple and opposite or 3-foliolate and alternate

GENTIANACEÆ, p. 378.

Ovary 2-celled; fruit commonly 2-celled; stamens 5; leaves alternate.

Leafless parasitic twining plant

Cuscuta, p. 388.

Leafy plants.

Corolla plaited in the bud; calyx of 5 distinct sepals

CONVOLVULACEÆ, p. 385.

Corolla valvate or plicate in the bud; calyx 5-toothed

SOLANACEÆ, p. 390.

Ovary 2 to 4-celled; capsule circumscissile; corolla scarious; stamens 2 or 4; style 1; acaulescent herbs

PLANTAGINEÆ, p. 418.

Ovary 3-celled, the flower otherwise 5-merous; style 3-cleft; capsule 3-valved

POLEMONIACEÆ, p. 422.

Ovary 4-celled and commonly 4-lobed, splitting at maturity into as many nutlets; stamens 5; styles 2, distinct; leaves alternate (at least the upper); flowers in coiled racemes or spikes

BORAGINACEÆ, p. 440.

Pistils 2 (the ovaries distinct but the styles or stigmas united), becoming follicles; leaves opposite or whorled; plants with milky juice.

Stamens and stigmas united, the column bearing hood-like
appendages ASCLEPIADACEÆ, p. 381.

Stamens and stigmas not united; no hoods
APOCYNACEÆ, p. 380.

Corolla from strongly bilabiate to slightly irregular.

Stamens 4 or 2.

Fruit a 1-celled capsule.

Stamens 2; corolla spurred; aquatic plants with finely divided
leaves, some bearing bladders

UTRICULARIACEÆ, p. 419.

Stamens 4; root-parasites without green foliage

OROBANCHACEÆ, p. 420.

Fruit a 2-celled capsule; leaves alternate or opposite

SCROPHULARIACEÆ, p. 394.

Fruit of 2 to 4 nutlets; leaves opposite.

Ovary not lobed, 2 to 4-celled, splitting into as many nutlets;
stamens 4 or 2; style 1, entire.

VERBENACEÆ, p. 450.

Ovary 4-lobed, splitting into as many nutlets; stamens 4 or 2;
style 1-cleft; stems square; herbage with the odor of mint.

LABIATÆ, p. 452.

Stamens 5, some or all woolly . . . Verbascum, p. 395.

2. Ovary inferior, i. e., adherent to the calyx-tube.

Stamens distinct.

Leaves alternate; flowers regular; stamens 5; ovary and capsule
2 to 5-celled; herbs CAMPANULACEÆ, p. 476.

Leaves opposite or whorled.

Stamens 1 to 3; flowers irregular; fruit 1-celled, 1-seeded; herbs.
VALERIANACEÆ, p. 474.

Stamens 4 or 5, rarely 2.

Ovary 1-celled; flowers in involucrate heads or short spikes;
fruit an achene; herbs . . . DIPSACEÆ, p. 475.

Ovary in ours 2-celled; flowers regular; fruit berry-like or dry,
commonly separating into 2 one-seeded achene-like por-
tions; leaves simple; herbs or shrubs

RUBIACEÆ, p. 467.

Ovary 2 to 5-celled; flowers regular or irregular; leaves simple
or compound; erect or twining shrubs

CAPRIFOLIACEÆ, p. 470.

Stamens united into a tube around the style.

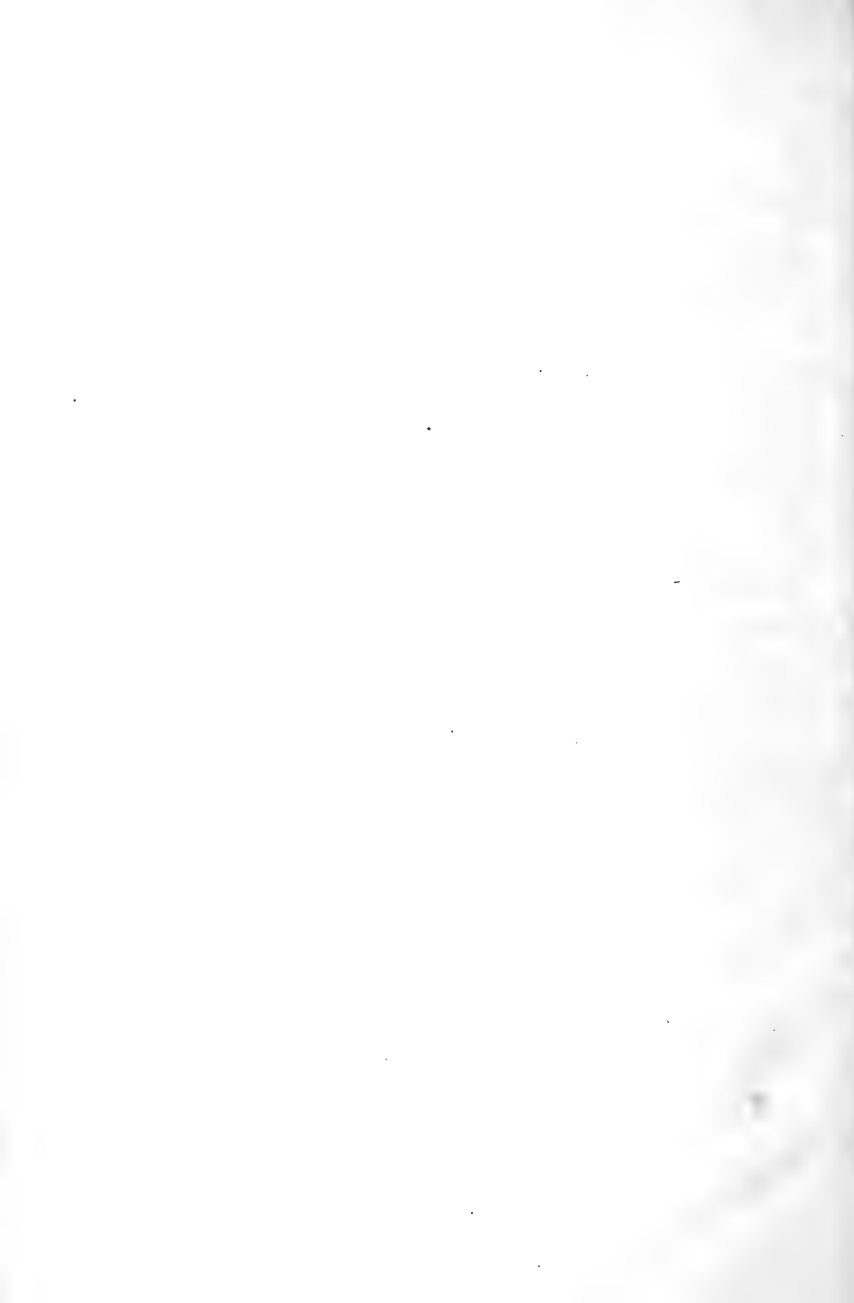
Flowers not in heads; leaves alternate.

Stamens 3; leaves palmately lobed; tendril-bearing herbs . . .
CUCURBITACEÆ, p. 319.

Stamens 5; leaves narrow; annual herbs
LOBELIACEÆ, p. 479.

Flowers collected into a head which is furnished with a calyx-
like involucre, the whole to the novice seeming like a single
flower; stamens 5, rarely 4; fruit an achene

COMPOSITÆ, p. 482.



Flora of Western Middle California.

GYMNOSPERMÆ.

Ovules borne naked upon the surface of a scale or bract, the ovules and seeds therefore without pericarp. Cotyledons 3 to 15, sometimes 2. Trees or shrubs, ours all evergreen, with needle-like, scale-like or linear leaves, mostly bearing cones or some with a berry-like fruit.

I. TAXACEÆ. YEW FAMILY.

Evergreen trees with linear leaves spreading in 2 ranks. Flowers dioecious. Staminate flowers consisting of a cluster of stamens, the filaments monadelphous in a column. Pistillate flower solitary, terminating short axillary branchlets, consisting of a single ovule, which in fruit becomes a seed with a bony coat set in a fleshy disk or enclosed by a fleshy covering. Embryo surrounded by endosperm; cotyledons 2.

Branches alternate; leaves carinate on the upper surface; seed borne in a berry-like cup. 1. TAXUS.
Branches mostly opposite or whorled; leaves flat, the under surface with a longitudinal channel or sulcus on either side of the midrib; fruit plum-like, the seed enclosed in a fleshy covering 2. TUMION.

1. TAXUS Tourn.

Ours a tree with a scaly bark. Flowers scaly-bracted. Stamens 8 to 10 in a cluster, the 5 to 9 anther cells formed under a shield-like connective. Ovule seated upon a circular disk, which in fruit becomes cup-shaped, fleshy and red, surrounding the bony seed, the whole berry-like.

1. *T. brevifolia* Nutt. YEW. Tree 18 to 30 ft. high; leaves with carinate midnerve, somewhat revolute, cuspidate, short petioled; clusters of stamens 2 lines long; fruit about 3 lines long.

Sierra Nevada; Mt. Shasta; and southward in the Coast Ranges to southern Mendocino Co.; to be expected in northern Sonoma.

2. TUMION Raf. TORREYA.

Branches mostly in whorls or opposite, spreading or drooping. Leaves nearly flat, decurrent, not carinate, the under surface with a longitudinal channel or furrow on either side of the midrib. Stamens

in a cluster 24 to 32, each stamen with 4 naked anther cells. Ovule enclosed in a fleshy sac, the whole becoming drupe-like in fruit. (Greek tumion, name of Dioscorides for a species of Yew tree.)

1. **T. Californicum** (Torr.) Greene. CALIFORNIA NUTMEG. Adult trees 45 to 80 ft. high; leaves mostly $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, $1\frac{1}{2}$ lines broad, tapering slightly to the pungent apex, nearly flat, shortly petioled; staminate clusters 4 or 5 lines long; fruit plum-like, 1 to $1\frac{1}{2}$ in. long.

Coast Ranges from Marin and Napa Cos. northward (towards the coast the trees are very tall, towards the interior often only 5 or 6 ft. high); Sierra Nevada. May to July.

2. CONIFERÆ. PINE FAMILY.

Trees or shrubs, ours evergreen, with resinous juice, needle-shaped, awl-shaped, or linear leaves, the flowers in cone-like aments without perianth. Male flowers consisting of stamens only, the anthers situated on the under side of a shield-like scale; cones deciduous. Fertile ament with 2 or more ovules at the base of each scale, the scales few or many, spirally imbricated and becoming in fruit a dry cone or the scales sometimes coalescent and succulent. Seed large and nut-like and winged, or small and bony. Embryo straight in the axis of the endosperm.

Leaves scattered or fascicled, linear to needle-shaped; flowers monœcious; pistillate ament of numerous spirally imbricated carpels in the form of scales, each scale in the axil of a thin persistent bract, in fruit forming a dry woody cone; scales of staminate ament also spirally arranged, herbaceous, colored yellow; ovules 2 at the base of each scale on the inner face, inverted.

Cones maturing the first year, their scales remaining thin; leaves solitary.

Branchlets rough from the prominent raised leaf-scars, bracts of the fertile cones smaller than the scales 1. **TSUGA**.

Branchlets smooth, the leaf-scars not raised; bracts of the fertile cone much longer than the scales 2. **PSEUDOTSUGA**.

Cones maturing in the second year, their scales becoming corky or woody and thickened; leaves in clusters of 2 to 5, surrounded at base by a sheath of scarious bud-scales 3. **PINUS**.

Leaves not fascicled, linear or ovate-lanceolate; flowers monœcious.

Leaves alternate; scales of the fertile ament about 20 to 30, spirally arranged, in fruit forming a woody cone; bracts none; seeds not winged 4. **SEQUIA**.

Leaves opposite; scales of the fertile ament 6, in fruit an oblong cone composed of imbricated oblong scales, seed unequally 2-winged 5. **LIBOCEDRUS**.

Leaves opposite or ternate, scale-like or subulate; scales of the fertile ament few, decussately opposite, becoming a small closed cone or berry-like.

Diœcious; fruit berry-like with bony ovate seeds; leaves ternate or opposite. 6. **JUNIPERUS**.

Monœcious; fruit a globose cone; leaves opposite 7. **CUPRESSUS**.

1. **TSUGA** Carriere. HEMLOCK.

Leaves appearing 2-ranked, with a single dorsal resin-duct, conspicuously petioled, jointed near the base, the lower portion persistent and at length ligneous, forming a raised scar. Staminate flower a subglobose cluster of stamens, from the axils of last year's leaves, the

long stipe surrounded by numerous bud-scales; connective of the anthers terminating in a short spur or knob. Fertile flowers on the end of last year's branchlets; bract a little shorter than the scale. Cones maturing the first year, pendulous, their thin scales and bracts persistent.

1. **T. heterophylla** Sarg. WESTERN HEMLOCK. A tree 60 to 75 ft. high, 2 ft. in diameter or less, with usually thin reddish-brown bark; ultimate branchlets when young long hairy; leaves 4 to 10 lines long; staminate flowers 2 to 3 lines in diameter, raised out of the bud-scales on a slender stipe $4\frac{1}{2}$ lines long; cones oblong-cylindrical, pointed; bracts closely attached to the back of each scale, obtusely 3-lobed; scales longer than wide; seeds 1 to $1\frac{1}{2}$ lines long, the wing twice longer, widest below; cotyledons 3 to 4.—(*T. Mertensiana* Carr.)

Occurs sparingly in Marin Co.; from northern California to Alaska it is abundant, forming vast forests, the trees 100 to 200 ft. high and 2 to even 8 ft. in diameter. The cones are pendent from the tips of very numerous slender hairy branchlets. The Alpine Hemlock, *T. Mertensiana* Bong. (*T. Pattoniana* of Bot. Cal.) is found at timber line in the High Sierras.

2. PSEUDOTSUGA Carriere. FALSE SPRUCE.

Leaves flat, distinctly petioled, somewhat 2-ranked by a twist at the base, leaving transversely oval scars on the smooth branchlets. Male flowers an oblong or cylindrical staminal column, partly enclosed by conspicuous bud-scales; connective of the anthers ending in a short spur. Cones pendulous, maturing in the first year; bracts broadly linear, acutely 2-lobed and long-pointed or aristate, exserted; scales persistent; seeds with the wing at last breaking off; cotyledons 6 to 12.

1. **P. taxifolia** Britton. DOUGLAS SPRUCE. A straight, tall, slender tree 30 to 150 ft. high and 2 to 5 ft. in diameter, the bark fissured; leaves flat, linear, petioled, $\frac{5}{8}$ to $1\frac{1}{2}$ in. long; male flower 5 to 10 lines long; cones oblong, pendulous, 4 in. long or less, remaining on the trees some time after the seeds have fallen; seeds triangular, the upper side convex and reddish-brown, the under side flat and white.—(*P. Douglasii* Carr.)

The Douglas Spruce, the most abundant and widely distributed forest tree in Western North America, is not uncommon in the seaward and middle Coast Ranges within our limits. In the South Coast Ranges it is frequent in the Santa Cruz Mountains but it is not known from the Mt. Hamilton and Mt. Diablo ranges or the Oakland Hills. In the north Coast Ranges it is very common in Marin and Sonoma Counties and is only less abundant in Napa Valley where it gives a decided character to the landscape. It is found on both the west and east slopes of the Mayacamas Range bounding Napa Valley on the east but is not found in the Vaca Mountains of the Inner Coast Range. Northward in Mendocino, Humboldt, and Del Norte

Cos. the Douglas Spruce forms extensive forests. The trees are often gigantic, being 15 ft. in diameter and in crowded forests attaining a height of 300 feet., the perfectly straight columns without a branch for 100 to 200 ft. The bark on the older trees is thick and dark-brown, with deep longitudinal fissures. In Oregon it is known to woodsmen and lumbermen as "Oregon Pine" and in California is commonly called "Fir" or "Red Fir." This tree ranges also through the Sierras southward to the head waters of Stevenson Creek, a branch of the San Joaquin River, at an elevation of 3,000 to 5,500 ft.

3. PINUS Tourn. PINE.

Primary leaves thin and chaff-like, bearing in their axils the needle-shaped evergreen leaves, in fascicles of 2 to 5, from slender buds, some of the thin scarious bud-scales sheathing the base of the cluster. Staminate flower an oblong cylindrical staminal column, crowded in a whorl at the base of the shoot of the same spring, consisting of numerous stamens spirally inserted on the axis, with very short filaments and a scale-like connective, this ending in a mere knob or rather large semi-circular crest. Pistillate inflorescences solitary or clustered below the terminal bud, or lateral on the growing shoot, consisting of imbricated carpellary scales in the axils of (and much larger than) the persistent bracts, bearing a pair of inverted ovules at base. Cones maturing in the second year, spreading or reflexed; scales woody and thickened and at the apex, upon the exposed surface (or apophysis), bearing a more or less thickened protuberance or umbo; umbo unarmed or provided with a prickle or spine. Seeds 2, nut-like, partly sunk at the base of each scale and in separating carrying away a part of the scale as a thin wing. Cotyledons 3 to 16, linear.

Cones subterminal, *i. e.*, near the ends of the branches.

Leaves in fives, their sheath loose and deciduous; cones cylindrical, 10 to 18 in. long, subterminal, the apophysis thin with a terminal unarmed umbo 1. *P. Lambertiana*.

Leaves in threes, serrulate, sheaths persistent; cones oval, 4 to 6 in. long, in falling breaking near the base, some of the lower scales persistent on the peduncle 2. *P. ponderosa*.

Cones lateral, borne along the sides of the branches.

Leaves in threes; cones opening at maturity, deciduous or remaining on the branches for 2 or 3 years, 6 in. long or more.

Cones long-oval, 12 to 15 in. long; scales ending in thick incurved spur-like spines; leaves erect 3. *P. Coulteri*.

Cones short-peduncled, short-oval, 6 to 10 in. long; leaves drooping 4. *P. Sabiniana*.

Leaves in threes; cones short-peduncled, remaining closed and persistent for many years, less than 6 in. long.

Cones short-oval, very oblique, 3 to 5½ in. long 5. *P. radiata*.

Cones conic-cylindrical, oblique at base, 3 to 5 in. long; all the scales with sharp prickles 6. *P. attenuata*.

Leaves in pairs.

Cones ovate, oblique, prickly, 1½ to 2½ in. long 7. *P. muricata*.

1. *P. Lambertiana* Dougl. SUGAR PINE. Trees 100 ft. high or more, and 6 to 10 ft. in diameter, with light-brown bark irregularly

fissured; leaves in clusters of 5, $3\frac{1}{2}$ to 4 in. long; cones 10 to 18 in. long, 2 to 3 or, when expanded, 4 to 5 in. thick, pendent from the ends of the horizontally-spreading branches; scales 1 to $1\frac{1}{2}$ in. wide, widest at apex, apophysis not thickened, umbo terminal, blunt; seeds obovate, 5 to 6 lines long, with a thin oblong obliquely truncate wing 10 to 12 lines long; cotyledons 13 to 15.

The most conspicuous tree of the Sierra coniferous belt, growing 120 to 200 ft. high, with a trunk diameter of 6 to 10 or even 12 ft. The tree is uncommon in western California and is of restricted distribution. In the South Coast Ranges it has not been reported from the mountains in the neighborhood of San Francisco Bay, although further southward it occurs in the Santa Lucia Mountains. In the high Coast Ranges north of Clear Lake the Sugar Pine frequently forms considerable forests, particularly in the region of the Yallo Bally, where there are magnificent specimens 22 ft. in circumference and 150 to 175 ft. high. From this region the Sugar Pine marches southward along the Mayacamas Mountains (which is the dividing ridge of the Coast Ranges) into Lake Co., and is not uncommon about Glenbrook and on Cobb Mountain. The most southerly station in the North Coast Ranges is the Sutro Ranch between Mt. St. Helena and the Oathill Mine, Napa Co., where there are said to be several hundred trees. In early days there were a few trees on Pope Mountain and on Howell Mountain, but they have long since been destroyed for their valuable timber. A locality on Austin Creek in Sonoma Co. has been reported in *Erythea*, IV. 152, but needs confirmation.

2. **P. ponderosa** Dougl. **YELLOW PINE.** A tree 60 to 100 ft. high or more with yellowish or somewhat whitish bark, very thick and deeply fissured into large plates but the aspect of the trunk notoriously variable; leaves 5 to 13 in. long; male flowers long and flexuous, crowded into rosettes 3 to 5 in. in diameter, on the ends of the branchlets; cones oval, 4 to 6 in. long, $2\frac{1}{2}$ to 3 in. thick; apophysis rather short, terminating in a short thick prickly incurved umbo; seeds $3\frac{1}{2}$ lines long, 3 lines wide, obliquely sub-rhombic; wing 10 lines long, chartaceous; cotyledons 6 to 9.

Abundant in the Sierras at or above 5,000 feet, where the trees are 100 to 200 ft. high and 15 to 20 ft. in circumference. In the Coast Ranges the Yellow Pine is more common than the Sugar Pine and occurs sparingly in Sonoma Co., and is to be seen frequently in Napa Co.; notably, there is a fine forest on the Howell Mountain plateau, south of Angwin's. There are no trees known in the Inner Coast Ranges bounding Solano and Yolo Counties. In the South Coast Ranges, the tree has not been recorded from the Bay Region, except from the Mt. Hamilton ridges. About Glenbrook, in Lake Co., the woodsmen have three varieties of *P. ponderosa*, viz.:—Black Pine, Bull Pine and Yellow Pine, which they distinguish by the color and fissuring of the bark.

3. **P. Coulteri** Don. **BIG-CONE PINE.** Trees 60 to 80 ft. high or more and 1 to 2 ft. in diameter, with thick, rough, almost black bark;

leaves crowded at the ends of the thick branchlets, 8 to 12 in. long and nearly a line wide; male flowers cylindric, 1 to $1\frac{3}{4}$ in. long; cones shortly peduncled, long oval, pointed, 12 to 15 in. long; scales $1\frac{1}{4}$ to $1\frac{1}{2}$ in. wide, terminating in a long spur-like umbo 2 in. long; seeds oval, slightly ridged, black, 6 to 7 lines long; wing 10 to 15 lines long; cotyledons 11 to 14.

Mount Diablo Range, southward to the Santa Lucia and San Bernardino Mountains. While the trees in Pine Cañon, Mt. Diablo, are clearly of this species, the trees in Mitchell Cañon grade very closely to *P. Sabiniana* in the characters of cones and foliage.

4. *P. Sabiniana* Dougl. **DIGGER PINE.** **GRAY-LEAF PINE.** Trees usually 20 to 45 ft. high, freely branching and round topped, with rough ash-gray bark, slender glaucous branchlets and sparse grayish foliage; leaves 8 to 12 in. long and $\frac{1}{2}$ line wide; male flowers, oblong, about 10 lines long, in an elongated spike; crest of anthers semi-orbicular; cones short-oval, 6 to 10 in. long, 4 to $5\frac{1}{2}$ in. in diameter; apophyses stout, projecting, the points incurved, 1 in. long; seed oblong, acutely margined below the middle; seed subcylindric, about 10 lines long, dark; wing $4\frac{1}{2}$ lines long; cotyledons 15 to 16.

Hot dry hills of the Inner Coast Ranges north of San Francisco Bay, ranging westward to Napa Valley and the hills near Healdsburg and Skaggs Springs. South of the bay it is common in the Mt. Diablo region, and is found far to the southward. It is, in addition, the most characteristic tree of the low foothills of the Sierras. The nuts were in former days an important article of food to the Indians, whence the widely-diffused common name, "Digger Pine."

5. *P. radiata* Don. **MONTEREY PINE.** Trees 25 to 40 or even 80 to 100 ft. high, with black, very hard bark, 2 to 3 in. thick; foliage bright green, leaves 4 to 6 in. long; male flowers oblong, 6 lines long, in a spike 1 to $1\frac{1}{2}$ in. in length; anthers small, crested; cones in whorls about the trunk and branches, shortly peduncled, strongly declined, obliquely short or long-oval, 3 to $5\frac{1}{2}$ in. long, 2 to 4 in. in diameter; scales on the outside, towards the base of the cone, developed into hemispherical tubercles or knobs, 3 to 6 lines high, becoming devoid of the minute incurved prickles; seeds 3 to 4 lines long, the wing 7 to 9 lines long.—(*P. insignis* Dougl.)

Very restricted in its distribution: Pescadero, southward to Monterey and Pacific Grove, where it is a common and striking object in the landscape.

6. *P. attenuata* Lemmon. **KNOB-CONE PINE.** Small trees 2 to 25 ft. or sometimes 40 ft. high, with thin, light brown bark; leaves 3 to 7 in. long, distantly serrulate; male flowers cylindrical, 7 to 9 lines long, disposed in an elongated spike; cones clustered, $2\frac{1}{2}$ to 5 in. long, somewhat oblique, the scales equal all around or frequently developed on the outside into very stout, strong, conical tubercles, all with slender, sharp, but not persistent prickles; seeds nearly 3 lines long, the wing 10 lines long, $2\frac{1}{2}$ to 3 lines wide, the width sub-equal throughout.—(*P. tuberculata* Gordon.)

Throughout the entire length of the Coast Ranges, and occasional in the Sierras. Mt. St. Helena, *Jepson*; Moraga Valley, *Dary*; and the Santa Cruz Mountains. The cones persist for very many years, forming circles on the trunks from near the base to the summit; even young trees only a few feet high are often full of cones. The seeds are seldom liberated except when the cones are partially burned in a forest fire. It is very interesting that a burned forest of the Knob-Cone Pine is promptly resown with its own seed.

7. *P. muricata* Don. BISHOP PINE. Middle-sized tree, 25 to 40 ft. high, with the trunk 1 to 2 ft. in diameter; leaves with serrulate edges, 3 to 4 in. long; sheaths 6 lines, or at least only 2 lines long; cones $1\frac{1}{2}$ to commonly $2\frac{1}{2}$ or even 3 in. long, the length not greatly in excess of the diameter; scales oblong, scarcely or not at all widened above; prickles short and stout, 1 line long, or the scales terminating in very stout, straight, somewhat incurved spurs, 4 lines long; seeds $2\frac{1}{2}$ to 3 lines long, black; wing 6 lines long, $2\frac{1}{2}$ lines wide, widest above the middle; cotyledons 4 or 5.

Swamps or wind-beaten hills, near the sea; Santa Lucia Mountains northward to Sonoma and Mendocino Cos. A very fine forest may be found on Point Reyes, within a few miles of Olema. In the peat-bogs of Sonoma Co., the species reaches its most vigorous development, the trees in that locality attaining a height of 80 to 150 ft. The cones persist for a very lengthened period,—often 20 to 40 years, not releasing the seeds for many seasons, thus providing a most effective system of storage. A patulous or flattened crown is very characteristic of this pine and it has, also, the smallest cones of any species within our limits.

P. CONTORTA Loud., Beach Pine or Scrub Pine, is frequent on the Mendocino Coast from Pt. Arena northward, as a low tree, 5 to 20 ft. high. It may be readily distinguished from *P. muricata* by its shorter leaves (1 to $1\frac{1}{2}$ in. long, but also in pairs), and its much narrower cones of about the same length. The var. *Murrayana* is the Tamarack or Lodge-pole Pine of the High Sierras.

4. *SEQUOIA* Endl. REDWOOD.

Tall trees, with linear to ovate-lanceolate or triangular-acute alternate leaves. Stamens numerous, anther cells 2 to 5. Scales of the fertile ament more numerous than those of the staminate, spirally arranged with 3 to 7 ovules at the base of each scale, in fruit forming a woody cone which matures the second year; scales divergent at right angles to the axis, thick and cuneate, with a rhomboidal rugose umbilicate apex. (Said to be named for a celebrated Cherokee Indian, who invented an alphabet for his tribe.)

1. *S. sempervirens* Endl. COAST REDWOOD. Trees 50 to 300 ft. in height and 3 to 12 ft. in diameter; leaves bright green, spreading in 2 ranks, petiolate, acute, and often pungent, 4 to 9 lines long and 1 line wide; staminate flowers $1\frac{1}{2}$ to 3 lines long; cones elliptic-globose, 9 to 12 lines long; scales abruptly widened and thickened

above the middle, with a rhomboidal apex and depressed umbo; seeds brown, 2 lines long or less.

The redwood is the most characteristic and abundant forest tree of the coast region. It is seldom found 30 miles from the ocean, never ranging inland beyond the influence of the sea-fogs, and forms a narrow belt along the coast, from southern Monterey Co. to the Oregon line. It is a common tree in the Santa Cruz Mountains, where there is an especially fine grove, famous as the "Santa Cruz Big Trees." In the Mt. Diablo Range, the redwood is not known, except in one limited locality on Redwood Peak, in the Oakland Hills, directly opposite the Golden Gate. In Napa Valley it is rather common and passes over the summit of Howell Mountain and descends the slope towards Pope Valley. It thus crosses at one point the divide of the North Coast Ranges, and this locality is the farthest of any from the ocean. The redwood belt has here, consequently, its greatest width. It is the tallest tree on the American continent. In the forests near Scotia, a tree 662 years old, measured in September, 1896, by C. S. Sargent, had a trunk diameter of 10 ft. 5 in., at 6 ft. above the ground, and was 340 ft. in height. Trunks from 15 to 20 ft. in diameter are not uncommon in that region, and trees 20 to 25 ft. in diameter, can be found. The wood is exceedingly valuable for all sorts of building purposes and in manufactures and the arts, wherefore the demand for it is constantly growing. The region of this great coniferous forest is a very attractive one, regarded from almost any point of view, and delights the eye and mind of the tourist, as well as the botanical traveler.

S. GIGANTEA Lindl. is the "Big Tree" of the Sierras.

5. *LIBOCEDRUS* Endl. INCENSE CEDAR.

Aromatic tree with flattened branchlets disposed in one horizontal plane, and scale-like opposite leaves, imbricated in four ranks. Flowers monœcious. Stamens 12 to 16, in many ranks, decussately opposite. Scales of the pistillate ament 6, thick, coriaceous and valvate, only the middle pair fertile; ovules 2. Cone oblong, of imbricated or valvate oblong scales; seeds 2 to each scale, unequally 2-winged, maturing in one season. (Greek *libas*, relating to a fragrant resin, and *cedrus*, cedar.)

1. *L. decurrens* Torr. INCENSE CEDAR. A tree with bright cinnamon-red bark and with spreading branches; leaves in two decussate pairs at each joint, 2 to 4 lines long, closely coherent, except the short acute tip; cones 10 lines long; seed 5 lines long, winged on both sides toward the apex, one wing very short, the other nearly as long as the scale.

Coast Ranges (Mendocino Co. and Mt. St. Helena, southward to the San Jacinto Mountains); Sierra Nevada.

6. *JUNIPERUS* L. JUNIPER.

Trees or shrubs with scale-like and awl-shaped leaves. Flowers in ours dicecious in small cones. Anther-cells 3 to 6, attached to the

lower edge of the scale. Fertile cones ovoid, of 3 to 6 succulent, coalescent scales, each bearing one ovule, in fruit becoming berry-like, bluish-black or reddish with white bloom, ripening the second year. (Said to mean youth-renewing, from its evergreen appearance.)

1. **J. Californica** Carr. CALIFORNIA JUNIPER. Usually a large shrub, 6 to 20 ft. high; leaves crowded on the ultimate branches, scale-like and acute, occasionally free and subulate, with a dorsal, glandular pit toward the base; berries reddish or brownish, oblong-ovate, 4 to 5 lines long, of four to six reduced scales; seed usually only one, brown, 3 to 4 lines long, with a thick, smooth, bony shell; cotyledons 4 to 6.

Moraga Pass, Mt. Diablo and southward; also in the Sierras. No definite station has ever been reported from the North Coast Ranges. Heart-wood reddish brown, sap-wood clear white.

J. OCCIDENTALIS Hook., Sierra Juniper, is at high elevations (6,000 to 10,000 ft.) in the Sierras; the fruit is smaller and blue-black; cotyledons 2.

7. **CUPRESSUS** Tourn. CYPRESS.

Shrubs or trees with the leaves small, scale-like and appressed, those on the ultimate branchlets in four ranks. Flowers monœcious. Staminate cones erect, small, $1\frac{1}{2}$ to 2 lines long; anthers borne on the under side of the sub-peltate scales, 3 to 5 to each scale. Pistillate cones erect, upon short lateral branchlets, of 6 to 10 very thick, roundish and peltate scales fitting closely together and forming in fruit a globose or sub-globose ligneous cone, which matures the second year. Ovules numerous, in several rows at the base of the scales, erect. Seeds acutely angled or margined. Cotyledons 2 to 4.

Scales with strong conical umbos; leaves with a conspicuous dorsal pit

Scales with small low umbos; leaves without dorsal pits

1. *C. Macnabiana*.

2. *C. Goveniana*.

1. **C. Macnabiana** Murr. McNAB CYPRESS. Shrub or tree 5 to 10 ft. high or more; leaves $\frac{1}{2}$ line long, with a conspicuous, usually resin-bearing pit or white gland on the back toward the apex, often slightly glaucous; cones 6 to 8 lines in diameter, globose, clustered, short-peduncled; scales 6 to 8, with strong conical umbos, the uppermost very prominent or horn-like and incurved; seeds $1\frac{1}{2}$ or mostly 2 lines long, brown.

Common in the hill country of eastern Napa Co. from Samuel's Springs to Pope Valley and northward into Lake Co. Shasta Co., F. M. Anderson, 1900. First collected in 1854, by Murray and Beardsley, near Mt. Shasta; named in honor of James McNab, of the Royal Botanic Garden, Edinburgh. Young cones reddish-brown.

2. **C. Goveniana** Gordon. GOWEN CYPRESS. A shrub or small tree, 6 to 15 ft. high; leaves without dorsal pits, rarely with lateral depressions, about $\frac{1}{2}$ line long; cones clustered, short pedunculate, globose, about 10 lines in diameter; scales 6, or mostly 8, with a very small, low umbo; seeds $1\frac{1}{2}$ to 2 lines long, black.

Plains of Mendocino Co.; Mt. Tamalpais, Marin Co.; Cedar Mountain, Alameda Co.; Monterey Co.; and southward to San Diego Co.

CUPRESSUS MACROCARPA Hartw., Monterey Cypress, is found only about Cypress Point, Monterey Co.

ANGIOSPERMÆ.

Ovules borne in a closed sac or ovary, which after fertilization of the ovules matures and forms the fruit.

MONOCOTYLEDONS.

Vascular bundles scattered through the stem, occurring without regular order. Leaves with parallel veins. Parts of the flower in threes or sixes. Embryo with 1 cotyledon.

3. GRAMINEÆ. GRASS FAMILY.

By J. BURTT DAVY.

Ours annual or perennial herbs, rarely tall and reed-like. Nodes solid, sometimes branching, the lower often emitting secondary roots; internodes usually hollow at maturity (pithy in most *Andropogoneæ*, some *Panicææ*, etc.) the lowest sometimes shortened and corm-like. Leaves alternate, with a $\frac{1}{2}$ phyllotaxy, mostly sessile, the lower portion (sheath) clasping the stem like a tube. Sheath lined by a membrane which is usually prolonged beyond the point of union of sheath with blade, as an erect, usually hyaline projection (the ligule) which is sometimes reduced to a ring of hairs or is rarely obsolete. Blades narrow, mostly linear; veins parallel, sometimes in aquatic species united by cross veinlets. Flowers collected into diminutive, spiciform, 1 to many-flowered clusters called spikelets, which are usually subtended by a pair (rarely one or both obsolete) of membranaceous, chartaceous, coriaceous or cartilaginous bracts. Spikelets arranged in spikes, racemes or panicles. Flowers perfect, monœcious, polygamous, or rarely diœcious; when monœcious the staminate and pistillate flowers may be in the same spikelet (sometimes in *Arrhenatherum*), in separate spikelets, or in separate inflorescences as in Maize (*Zea*); when polygamous, the staminate flowers may be either in the same spikelet, as in *Holcus*, etc., or more rarely in separate spikelets as in many of the *Andropogoneæ*. Flowers distichously arranged on the axis (the rachilla) of the spikelet, each subtended by a pair of modified leaves (rarely 1 being obsolete); the lower of these (the bractlet) often similar in texture to the bracts of the spikelet; the upper (the palea) usually thinner, hyaline, with usually 2 nerves,

mostly 2-keeled, the inflexed margins enwrapping the flower. Within and at the base of the bractlet are 2 (rarely 1, 3 or more), usually minute organs (the scales) which are sometimes considered as representing additional rudimentary bractlets, sometimes as the parts of a rudimentary perianth; the scales at the time of anthesis become turgid, pushing the bractlets and palea apart, thereby allowing the anthers and stigmas to protrude; after anthesis they lose their turgescence, becoming hyaline, and allow the bractlet and palea to close again. Perianth obsolete, unless represented by the scales. Stamens usually 3, rarely 1, 2, 6 or more, hypogynous; filaments capillary; anthers 2-celled, mostly versatile and pendulous at maturity, usually proterandrous. Ovary superior, 1-celled. Styles usually 2, free, or more or less united below, or obsolete; stigmas 2, widely branched and usually plumose, covering a large area and thus specially arranged to catch pollen carried by the wind, usually spirally branched, rarely barbellate with papillate cells. Ovule 1. Fruit in ours an achene, often adnate to the palea and sometimes also to the bractlet. Seed in ours adnate to the pericarp. Embryo small, outside the base of the endosperm.

KEY TO THE TRIBES.

- A.** Spikelets 1-flowered, the flower perfect; or with 1 perfect flower and 1 (rarely 2) empty bractlets or staminate flowers below (rarely above) it. Diccious species and species with 2 or more perfect flowers should be looked for under B.
- Both bractlet and palea cartilaginous, coriaceous or chartaceous (at least distinctly firmer in texture than the bracts) and becoming indurated in fruit.
- Rachilla jointed below the bracts so that the spikelets fall from the pedicel entire; spikelets terete, or flattened on the back only, not at all laterally compressed; either strictly 1-flowered or the perfect flower subtended by 1 (never more) empty bractlet or staminate flower; lower bract often herbaceous and usually much the smaller. 2. PANICEÆ, p. 29.
- Rachilla jointed above the bracts so that these remain after the flowers fall away; spikelets laterally compressed on both sides; subtended by 2 (rarely only 1) sometimes minute, empty bractlets or staminate flowers; bracts usually sub-equal. 3. PHALARIDÆ, p. 33.
- Only the bractlet firmer in texture than the bracts and becoming indurated in fruit; palea hyaline.
- Awn terminal, geniculate; bractlet cylindrical-involute:—Stipa in 4. AGROSTIDÆ, p. 37.
- Awn dorsal, geniculate; bractlet not cylindrical-involute:—sometimes Avena in 5. AVENÆ, p. 48.
- Neither bractlet nor palea firmer in texture than the bracts, though in Hordeæ both may be equally firm; often one or both of them hyaline.
- Spikelets pedicellate; arranged in lax or more or less dense and spikelike panicles or racemes; if in racemes or spikes these sometimes densely cylindrical but the spikelets not in distinct rows.
- Spikelets of two kinds in the same inflorescence, one polygamous the others imperfect or rudimentary; two (one of each kind) or several at a node.
- Spikelets in pairs, or the terminal in threes, at each node of the jointed rachis, one (or two) pedicellate and (in ours) imperfect, the other sessile and containing 1 perfect flower subtended by either a hyaline empty bractlet or a staminate flower. 1. ANDROPOGONÆ, p. 28.
- Spikelets crowded at each node of a dense, 1-sided, brush-like panicle; the fertile solitary, short, terminating the panicle-branches and entirely concealed by the long sterile spikelets, which consist of about 10 empty bractlets:—Lamarckia in 7. FESTUCÆ, p. 57.
- Spikelets all of one kind in the same inflorescence, though their contained flowers may be perfect, monœcious or polygamous.

- Perfect flower solitary, without empty bractlets or staminate flowers either above or below it.
 Bractlet with a dorsal awn arising from below the middle, or awnless.
 Awn sometimes obsolete, when present straight, not twisted 4. AGROSTIDÆ, p. 37.
 Awn always present, geniculate and twisted:—some forms of *Deschampsia* and *Trisetum* in 5. AVENÆ, p. 48.
 Bractlet with a terminal awn (sometimes very short):—some species of *Koeleria* and *Festuca* in 7. FESTUCEÆ, p. 57.
 Perfect flower with one or two staminate flowers or empty bractlets below (rarely above) it.
 Spikelet with 2 staminate flowers or 2 empty bractlets below the perfect flower:—*Anthoxanthum* and *Hierochloa* in 3. PHALARIDÆ, p. 33.
 Spikelets with only 1 staminate flower (never empty bractlets) below or above the perfect flower:—*Arrhenatherum* and *Holcus* in 5. AVENÆ, p. 48.
 Spikelets with 1 or 2 empty bractlets above the perfect flower:—*Melica*, *Koeleria* and *Festuca* in 7. FESTUCEÆ, p. 57.
 Spikelets sessile or very shortly pedicellate; arranged in two close, crowded rows forming 1-sided spikes or racemes; these racemes digitate or fasciculate, rarely solitary: rachis not breaking up at the nodes 6. CHLORIDÆ, p. 55.
 Spikelets arranged in 2 opposite rows, forming a 2-sided spike or raceme; sessile or very shortly pedicellate on teeth, or in notches or grooves of the rachis which is often flexuous; rachis in many cases jointed at the nodes, each internode at maturity falling away with the attached spikelet. 8. HORDEÆ, p. 72.
B. Spikelets with 2 or more perfect flowers (dicaucous in 8. Festuceæ in the genus *Distichlis* and sometimes in *Poa* and *Phragmites*); imperfect flowers, when present, uppermost (except in *Phragmites* and rarely in *Eragrostis*).
 Spikelets pedicellate, arranged in lax or more or less dense and spike-like panicles or racemes; when in racemes or spikes not in opposite rows on the rachis.
 Bracts large in proportion to the whole spikelet, usually enclosing all the flowers; one or more of the bractlets bearing a twisted and abruptly bent awn, usually on the back, rarely from between the teeth of the bifid apex or awnless; when not awned there are 2 nearly opposite flowers, and the rachilla is not prolonged beyond them; in *Avena sativa* the awn is often obsolete or straight, though the flowers are more than 2 and not opposite 5. AVENÆ, p. 48.
 Bracts small in proportion to the whole spikelet, usually scarcely exceeding the apex of the first flower; bractlets awnless, or with 1 to 3 straight awns, which are usually terminal, or rarely borne just below the apex 7. FESTUCEÆ, p. 57.
 Spikelets arranged in 2 opposite rows, forming a bilateral spike or raceme; sessile or shortly pedicellate on teeth, or in notches or grooves of the rachis which is often flexuous; rachis in many cases jointed at the nodes, each internode at maturity falling away with the attached spikelet. 8. HORDEÆ, p. 72.

TRIBE 1. *Andropogoneæ*. SORGHUM TRIBE.

Inflorescence a simple or compound panicle, the ultimate branches of which consist of spike-like racemes of few or many spikelets. Rachis usually jointed at the nodes. Spikelets in pairs at each node, or in triplets at the end of each raceme, of two kinds, one of each pair sessile and perfect or polygamous, the other pedicellate and imperfect, rudimentary, or reduced to the pedicel; pedicel and callus often clothed with long silky hairs; spikelets generally with but one flower, usually with a hyaline empty bractlet below it, or rarely the latter bearing a staminate flower in its axil, or obsolete. Lower bract always more indurated than the bractlets, the latter often hyaline and

usually one of them bearing a bent or twisted awn; internodes between the different bractlets or flowers not measurable. Palea usually shorter than its bractlet, sometimes obsolete. Stamens usually 3, rarely only 2 or 1.

1. ANDROPOGON L. SORGHUM.

Our only species belongs to the sub-genus *Sorghum*, having the stems hard and pithy; racemes solitary or in pairs, paniced; joints of the rachis without a translucent line; bracts broad-lanceolate, finally indurated and shining, awnless (in our species); lower bractlet empty, or sometimes obsolete, much the smaller, hyaline; upper very slender, awnless or with a geniculate awn; palea small, hyaline or obsolete. Scales wedge-shaped. Stamens 3. Styles distinct. (Greek andros, a man, pogon, a beard, having reference to the bearded callus of the staminate spikelets in most species).

1. *A. Sorghum* Brot. var. *Halepensis* Hackel. JOHNSON-GRASS, Perennial, rootstock stout, creeping; stems stout, erect, 2 to 5 ft. high; leaf-blades flat, with undulate margins, 8 to 24 in. long, $1\frac{1}{2}$ to 3 in. wide, apex drooping; panicle variable 1 to 2 feet long, oblong-elliptical, dense or rather loose, more or less drooping; branches mostly in whorls of 4, rarely 2 or 6; sessile spikelets variable, lanceolate or elliptical, 2 to 3 lines long; bracts equal; lower bract of the perfect spikelet firm, more or less shining and often dark colored, obscurely 5 to 9 or 11-nerved; margins involute; upper 3 to 7-nerved: bracts of the staminate spikelets narrow and more acuminate, the lower almost 2-keeled, with 2 prominent nerves near each margin; upper 5-nerved; empty bractlet one-fourth shorter than the lower bract, elliptical-oblong or oval, delicately 2-nerved; lower flower-enclosing bractlet one-half as long as the upper bract, broadly oval, obtuse, 2-lobed, often bearing a short awn; anthers yellow, 1 to $1\frac{1}{2}$ lines long; scales fringed; pedicellate spikelets sometimes reduced to the bractlet, much narrower than the fertile ones.—(*Sorghum Halepense* Pers.)

Originally introduced into the United States as a forage plant, now a troublesome weed in orchards and elsewhere. Sparingly naturalized within our limits: Healdsburg; Lower Sacramento; Napa City; also in the San Joaquin and Chino valleys.

TRIBE 2. Paniceæ. MILLET TRIBE.

Spikelets arranged in spikes, racemes or panicles, these sometimes digitate or in pairs; rachis usually not jointed at the nodes and therefore not breaking up at maturity; pedicels jointed below the bracts so that these fall away with the rest of the spikelet at maturity. Spikelets terete or flattened on the back only, not at all laterally compressed, all alike, either strictly 1-flowered, or with 1 perfect flower, and a staminate flower, or bractlet and palea, or empty bractlet, below it; lower bract usually much the smaller; perfect flower strictly terminal, its bractlet and palea alike, cartilaginous, coriaceous, chartaceous, or at least always firmer in texture than the bracts, awnless; lower bractlet sometimes similar in texture to the bracts, sometimes short-awned.

Spikelets without any involucre of bristles or spines.

Bractlet (in ours) apparently 1 only, enclosing a perfect flower; spikelets in 1-sided racemes or spikes which (in ours) are arranged in pairs, or (rarely) in panicles 2. *PASPALUM*.

Bractlets 2, the upper subtending a perfect flower, the lower empty or subtending a staminate flower; spikelets sometimes in 1-sided racemes or spikes; these digitate or in panicles 3. *PANICUM*.

Spikelets subtended by an involucre consisting of from one to many bristles or spines (sterile branches) which are sometimes grown together.

Spikelets deciduous; bristles persistent 4. *CHÆTOCHLOA*.

2. *PASPALUM* L.

Inflorescence of few digitate, or many paniced, spikelike racemes. Spikelets in 1 to 4 rows upon one side of a flattened, jointless rachis, jointed upon their short pedicels, plano-convex, obtuse or acute, awnless, 1-flowered; bracts apparently 2 to 3 owing to the presence of an empty bractlet which resembles a bract in size and texture and takes its place; lower bract often obsolete, when present minute 1-nerved, slender, and placed on the flat side of the spikelet; upper much larger, few-nerved. Bractlet (in ours) apparently 1 only, really 2; lower empty, membranaceous, resembling and nearly equaling the upper bract and performing the function of the absent or reduced lower bract, 3-nerved; flower enclosing bractlet roundish or ovate, coriaceous, rarely mucronate or with a few minute hairs at the apex, large, convex, and partly enclosing the palea. Palea smaller than its bractlet, roundish or ovate, coriaceous, flattish. Scales 2, wedge-shaped or quadrate, emarginate. Stamens 3. Ovary oblong, smooth; styles elongated. Achene enclosed by the indurated bractlet and palea. (The ancient Greek name for Millet-grass.)

1. *P. distichum* L. KNOT-GRASS. Rootstock perennial, widely creeping; stems 6 to 24 in. high; sheaths somewhat crowded, smooth or hairy, bearded or ciliate at the throat; blades flat, sharp-pointed, linear-lanceolate, $1\frac{1}{2}$ to 3 in. long, 1 to 2 lines wide, sparingly hairy above, glabrous below, somewhat glaucous; spikes 2 (rarely 3 or 4), 1 to 4 in. long, sub-erect, densely flowered, one sessile, the other shortly pedicellate; rachis $\frac{1}{2}$ to 1 line wide; spikelets $1\frac{1}{2}$ lines long, ovate, acute; those in the middle of a row overlapping about $\frac{1}{4}$ their length; bracts more or less pubescent.

Somewhat resembling Bermuda-grass but readily distinguished by its stouter habit and by usually bearing only 2 spikes to each inflorescence; appearance much modified by habitat. A tropical and subtropical species, now common in marshy places throughout the State; probably introduced: Lower Sacramento, 1893, *Jepson*; in water in a ditch near Agnews, *Miss Cannon*; Clear Lake; Arbuckle; Crescent City; at Upper Lake, Lake Co., "it has completely taken possession of the Tule lands in the last 7 years," *Edmonds*, 1897. Apr.-Oct. Considered a very valuable pasture-grass for marsh-lands.

3. *PANICUM* L. PANIC-GRASS.

Leaves often hirsute or hispid with stiff hairs arising from tubercles between the nerves. Panicle loose and spreading, or close and spike-

like; when the spikelets are crowded in pairs on one side of flattened spikelike branches, one spikelet is sessile the other pedicellate. Spikelets without involucre or bristles at the base, 1 or 2-flowered (when 2-flowered the lowest staminate) rarely awned, jointed on the pedicels below the bracts so that these fall away with the flower at maturity; bracts 2 (or 1 only); the lower smaller, often minute or obsolete; the upper equaling the perfect flower. Bractlets 2; the upper enclosing the palea and a perfect flower; the lower resembling the upper bract and empty or bearing a staminate flower or empty palea, the latter when present very thin and hyaline; upper bractlet and its palea alike, coriaceous or cartilaginous, usually flattened parallel with the bracts, awnless. Scales 2, fleshy, truncate. Ovary smooth, oblong; styles distinct or very shortly united at the base; stigmas usually purple and longer than the styles. Achene compressed, plano-convex, enclosed by the indurated bractlet and palea. (The Latin name for some cereal, from panis, bread, one species—the Millet, *P. miliaceum*—having been cultivated from prehistoric times as a cereal.)

Spikelets crowded in 2 to 4 rows on 2 sides of triangular, digitate or clustered spikes.

Lower bract minute or obsolete; bractlets awnless, pubescent or nearly smooth 1. *P. sanguinale*.

Spikelets imbricate, sessile on 2 sides of a triangular rachis, usually rough with stiff hairs.

Bractlet awned or awn-pointed, mostly shortly hirsute on the nerves 2. *P. Crus-galli*.

Spikelets in lax panicles, pedicellate, awnless.

Annual; spikelets acutely pointed; panicle-branches mostly angular 3. *P. capillare*.

Perennial; spikelets obtuse or barely pointed; panicle-branches filamentous. 4. *P. dichotomum*.

1. *P. sanguinale* L. CRAB-GRASS. Glaucous annual; stems usually prostrate and creeping at base, then ascending or erect, 1 to 2 ft. long, usually stout; lower nodes swollen and rooting; sheaths sparingly hairy with long, stiff, white hairs; throat with a tuft of hairs on each side; ligule about 1 line long, broad, truncate, denticulate; blades 2 to 4 in. long, 2 to 3 lines wide, scabrous on both sides; panicle-branches, 4 to 6 or more, digitate or clustered, sub-erect, straight, 3 to 5 in. long, 3-sided, spikelet-bearing to the base on 2 sides only, about $\frac{1}{2}$ line wide on the broad side, ciliate-scabrous; spikelets in pairs, in 2 to 4 rows, narrowly lanceolate-acuminate, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long, one on a ciliate-scabrous triangular pedicel, the other sessile below it and overlapping; bracts much shorter than the spikelet; lower less than $\frac{1}{4}$ line long, triangular, acute; upper $\frac{3}{4}$ to 1 line long, linear, 3 to 5-nerved, ciliate with long hairs; lower bractlet empty, membranous, 3 to 5 or 7-nerved, ciliate; upper rather shorter, faintly 3-nerved, chartaceous, glabrous, completely enclosing the palea; achene flattened, oblong, 1 line long.

A cosmopolitan weed. Elk Grove, *Drew*; Lower Sacramento, *Jepson*; Stege; Napa Co. July–Sept.

2. *P. Crus-galli* L. BARNYARD-GRASS. Annual; stems ascend-

ing. 1 to 4 ft. high, very stout; lower nodes much swollen, upper constricted; sheaths sparsely hairy; ligule obsolete; blades variable, 6 to 14 in. long, 4 to 6 lines wide, flat, glabrous, or sparsely hairy; margins rough, often wavy, ciliate at the base with long hairs; panicle 3 to 6 in. long, green or purple, densely hairy at the nodes; branches somewhat remote, the lowest sometimes 3 in. long, triquetrous, minutely pubescent; pedicels with long, stiff hairs; spikelets crowded on 2 sides of the rachis, $1\frac{1}{2}$ lines long; lower bract broad, triangular, about $\frac{1}{2}$ as long as the spikelet, 3-nerved; upper concave, broad, oval, 7-nerved, hispid on the nerves, pointed or rigidly awned; lower bractlet empty, shorter than the bracts, 5-nerved, its palea hyaline, 2-nerved; upper bractlet and palea polished, acute or obtuse.

A cosmopolitan weed, introduced into California in moist places beside sloughs and streams: Grand Island, *Jepson*; Fort Bragg, *Milliken*; Sequel Creek; Stege; Stockton, and near Guerneville. July–Nov.

3. *P. capillare* L. OLD-WITCH-GRASS. Annual; stems 1 to 2 ft. high, geniculate below, often branching at base and forming large tufts; sheaths and often the blades hirsute with stiff, spreading hairs; ligule reduced to a ciliate fringe; blades about 6 in. long, $2\frac{1}{2}$ to 4 lines wide, shortly acuminate, sparsely hairy; edges rough, ciliate below; panicle very diffuse, 6 to 12 in. long, sometimes 9 in. wide; branches solitary or in pairs, sometimes 6 in. long, slender, at first erect, then spreading and finally sometimes deflexed, mostly angular; spikelets in pairs at the ends of the long branchlets, oblong to oval-acuminate, acutely pointed, one long- the other short-pedicelled, the latter overlapping and 1 to $1\frac{1}{2}$ times as long; lower bract 1-nerved, acute; upper 5-nerved, pointed, nearly $\frac{1}{2}$ longer than the obtuse flower-enclosing bractlet; empty bractlet twice as long as the lower bract, its palea obsolete.

A very variable grass. Said to occur throughout the State: Lower Sacramento, *Jepson*; Guerneville. June–Oct. Of no agricultural value.

4. *P. dichotomum* L. BRANCHED PANIC. Perennial; stems 8 to 24 in. high, at first erect and simple, then decumbent and branching from the prostrate nodes; sheaths with a tuft of soft hairs at the nodes, mostly softly-hairy; lower blades nearly ovate, upper linear-lanceolate, smooth or hairy or velvety, acute, $1\frac{1}{2}$ to 4 in. long, 2 to 3 lines wide; terminal panicle exserted, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, open, ovoid or pyramidal; those of the branches short, often barely exserted; panicle-branches filamentous; spikelets 1 line long, obovate or ellipsoidal, obtuse or barely pointed, smooth or hairy; lower bract $\frac{1}{3}$ as long as the upper, roundish; upper 5 to 7-nerved.

Common in moist sandy soils along the coast and in moist places in the interior. Geysers, *Bolander*; Point Reyes. June–July.

4. CHÆTOCHLOA Scribn.

Annuals. Leaf-blades flat. Panicle spike-like, dense, cylindrical,

sometimes interrupted below. Spikelets as in *Panicum*, but always awnless, the short peduncles produced beyond them into one to several awn-like bristles which are at one side of the spikelet, not forming a complete involucre. (Greek chaite, bristle, chloe, grass, referring to the tuft of bristles at the base of the spikelet. A genus easily recognized by the dense spike-like panicle, usually bristling with numerous setæ; these issue from the pedicels just below the spikelets in the form of an involucre, and are not epidermal, like true hairs, but appear to be abortive panicle-branches.)

1. *C. glauca* (L.) Scribn. BRISTLY FOXTAIL. Stems erect, branching below, 1 to 2 ft. high, leafy; mouth of the sheath clothed with long, silky hairs; blades 4 to 12 in. long, 3 to 5 lines broad, scabrid or scabrous, sometimes sparsely ciliate; panicles $1\frac{1}{2}$ to $2\frac{1}{2}$ or 4 in. long, usually on a long, slender, naked peduncle, though, sometimes, at first partially enclosed by the uppermost sheath; bristles pale green or tawny yellow; spikelets oval, about 1 line long and a little less broad, obtuse or sub-acute, pale green.—(*Setaria glauca* Beauv.)

Introduced weed, perhaps not yet occurring within our limits. In the San Joaquin Valley at Fresno, *Bioletti*. June-Oct.

TRIBE 3. Phalarideæ. CANARY-GRASS TRIBE.

Spikelets arranged in panicles, all alike, with 1 perfect flower, which is terminal, and 1 or 2 empty bractlets or staminate flowers below it; empty bractlets occasionally very small or rudimentary. Bractlet and palea of the perfect flower alike, usually becoming indurated, laterally compressed, awnless, nerveless or with only 1 nerve.

Perfect flower subtended by 1 or 2 empty bractlets which are often minute or rudimentary.

Empty bractlets minute, entire, awnless or with minute bristles at the apex.

5. PHALARIS.

Empty bractlets equaling or exceeding the flower-enclosing bractlet, bifid and awned on the back 6. ANTHOXANTHUM.

Perfect flower subtended by 1 or 2 staminate flowers 7. HIEROCHLOE.

5. PHALARIS L. CANARY-GRASS.

Blades flat. Inflorescence a dense, spikelike, rarely interrupted, thyse. Spikelets crowded, 1-flowered. Bracts about equal in length, boat-shaped, complicate, strongly compressed laterally, usually winged-keeled, 3-nerved. Bractlet and palea of perfect flower subtended by 2, or only 1, small or rudimentary, more or less hairy, empty bractlets. Flower-enclosing bractlet and palea alike, shorter than the bracts, complicate, becoming indurated in fruit; palea a little the smaller. Scales 2 and minute, or obsolete. Stamens 3. Ovary smooth. (Greek phalaros, having a patch of white, from the broad, light-colored margins and patches between the nerves of the bracts in some species. Supposed to be the *Phalaris* of Dioscorides).

Spikelets all perfect; bracts decidedly winged-keeled on the back; annuals.

Rudimentary bractlets 2; thyse ovoid.

- Spikelets broad; nerves of bracts dark green, mid-nerve curved inwards above; wings broad, white. 1. *P. Canariensis*.
 Spikelets narrow; nerves of bracts pale green, mid-nerve straight from a little above the base; wings narrow, pale green. 2. *P. Caroliniana*.
 Rudimentary bractlet 1 only; thyse from ovoid-oblong to oblong-cylindrical. Spikelets ovate; nerves of bracts dark green, mid-nerve curved inwards from below the middle; wings narrow, white. 3. *P. minor*.
 Spikelets of secondary branches of the thyse imperfect or abortive, giving a gnawed appearance to the lower part of the thyse; wing of bract terminating in a horn. 4. *P. paradoxa*.
 Spikelets all perfect: bracts wingless or only slightly winged, keeled; annuals or perennials.
 Annual; $1\frac{1}{2}$ to 3 ft. high; thyse cylindrical, almost spikelike, mostly $2\frac{1}{2}$ to 4 in. long; bracts keeled; flower-enclosing bractlet abruptly acuminate. 5. *P. Lemmonii*.
 Perennial; stems 3 to 8 ft. high; inflorescence usually purplish; bracts strongly keeled; flower-enclosing bractlet acuminate.
 Thyse oblong, 1 to 2 in. long, usually dense. 6. *P. amethystina*.
 Panicle 3 to 6 or even 9 in. long, usually much interrupted or lobed. 7. *P. arundinacea*.

1. **P. Canariensis** L. CANARY-GRASS. Annual; stems erect, 1 to 3 ft. high, leafy; uppermost sheaths much inflated; ligule 2 to $3\frac{1}{2}$ lines long; blades 6 to 9 in. long, $1\frac{1}{2}$ to 5 lines wide; thyse 1 to $1\frac{1}{2}$ in. long, $\frac{5}{8}$ in. to $\frac{3}{4}$ in. wide, ovoid, dense, uninterrupted; spikelets $2\frac{1}{2}$ to 3 lines long, laterally flattened, obovate, abruptly pointed; bracts subequal, acute, broadly keeled from below the middle; keel nearly $\frac{1}{2}$ line wide, broadly white-margined, the mid-nerve curved inwards above; empty bractlets 2, about 1 line long, narrow, smooth; flower-enclosing bractlet about 2 lines long, pubescent when young, glabrous in age.

Native of Europe, reported as occurring sparingly near settlements in several localities within our limits. San Francisco, *Bolander*. Apr. The well-known "Canary-grass," a favorite bird-seed, much cultivated in the south of Europe.

2. **P. Caroliniana** Walt. SOUTHERN CANARY-GRASS. Annual; stems slender, erect, 1 to 2 ft. high; uppermost sheaths somewhat inflated; ligule $1\frac{1}{2}$ to 2 lines long, decurrent, obtuse or truncate, broad, completely enveloping the stem and folded over itself; blades $1\frac{1}{2}$ to $4\frac{1}{2}$ in. long, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines wide, acute, smooth; thyse 1 to 2 in. long, ovoid; spikelets $2\frac{1}{2}$ to 3 lines long; bracts acute, the mid-nerve straight from a little above the base, nerves and keel concolorous, pale green; empty bractlets about 1 line long, pubescent; flower-enclosing bractlet acuminate, pubescent.

Native of the southeastern States, and apparently not indigenous with us. Oakland, *Bolander*; Araquipa Rancho, Vacaville, *Jepson*. Apr.-May. Much less common than is generally supposed, *P. minor* being often mistaken for it, both in the field and in herbaria.

3. **P. minor** Retz. SMALL CANARY-GRASS. An erect, glabrous, leafy annual, from $7\frac{1}{2}$ in. to 3 ft. high, according to locality and season, branched sometimes from every node except the uppermost; upper sheaths sometimes glaucescent, much dilated, with a broad, scarious margin; ligule large, 1 to 3 or even $4\frac{1}{2}$ lines long, entire, obtuse; blades $4\frac{1}{2}$ to 13 in. long, $4\frac{1}{2}$ to $7\frac{1}{2}$ lines wide; in small specimens only 2 to 3 in. long, and 3 lines wide; thyse very dense and

compact, from ovoid-oblong and 1 in. long, to oblong-cylindrical and $2\frac{1}{2}$ in. long; about $\frac{1}{2}$ in. wide; spikelets 2 to 3 lines long and 1 line wide, lanceolate-acuminate, with a narrow, thin keel above the middle, sometimes irregularly notched; keel and veins ciliate-scarbid; empty bractlet reduced to a single, short, arcuate-subulate bristle with a distinct callus at the base, about $\frac{1}{2}$ line long, closely appressed to the back of the upper flower-enclosing bractlet; the latter $1\frac{1}{2}$ lines long, acute, faintly 5-nerved, more or less pubescent and ciliate above with silky hairs, pale brown, shining; anthers pale- or greenish-yellow.

Indigenous to the Mediterranean Region; now common in the Coast Ranges and great valley: Southern California; "Roadsides near windmill, Berkeley" about 1872, *McLean*. Little Oak, Solano Co., *Jepson*; common at Danville, near Martinez and near Princeton.

4. *P. paradoxa* L. GNAWED CANARY-GRASS. Stems erect, from a geniculate base, $2\frac{1}{4}$ ft. high, often branched from the lower nodes; sheaths usually inflated; ligule $1\frac{1}{2}$ to 2 lines long, obtuse and soon lacerate; blades 3 to $7\frac{1}{2}$ in. long, $1\frac{1}{2}$ to 2 lines wide, flat, scabrous on both surfaces, glaucouscent; panicle oblancoolate, obtuse, appearing as though gnawed below; usually only the primary branches bearing perfect spikelets, those of the secondary branches being abortive or imperfect; the pedicels of the spikelets in the lower one-third or one-half of the thyse are much reduced and their spikelets peculiarly aborted; perfect spikelets of lower part of thyse about $2\frac{1}{2}$ lines long, their bracts acuminate but not awned; those of the upper part about 1 line longer and awn-pointed; keel of bracts narrow, terminating in a long or short horn at $\frac{2}{3}$ from the base; staminate and neuter spikelets about 2 lines long, the keel running almost to the apex and shortly or barely horned; empty bractlets 2, minute, about $\frac{1}{4}$ line long, appressed to the flower-enclosing bractlet like horny calluses, each with 2 slender, cilia-like hairs about their own length at or near the apex; flower-enclosing bractlet about $1\frac{3}{4}$ lines long, obtuse, firm, sub-glabrous and shining; achene brown, with a black apex.

Native of the Mediterranean Region; introduced into the Coast Ranges and Great Valley regions: Petaluma, 1896, *Leckenby*; plentiful near Norman, Glenn Co., 1898; Pinole Creek Valley, 1900, *Davy*. May-July.

5. *P. Lemmoni* Vasey. LEMMON'S CANARY-GRASS. Annual; stems slender, erect, $1\frac{1}{2}$ to 3 ft. high; sheaths scarcely inflated; ligule conspicuous, 2 to 3 lines long; blades 3 to $7\frac{1}{2}$ in. long, 1 to 2 lines wide, long-acuminate; thyse $1\frac{1}{2}$ to 4 in. long, nearly cylindrical, sometimes slightly interrupted below; spikelets spreading, 2 to $2\frac{1}{2}$ lines long; bracts sub-equal, scarbid-keeled, not at all, or only minutely winged, narrow and acuminate; empty bractlets 2, about $\frac{1}{2}$ line long, very narrow, shortly hairy below; flower-enclosing bractlet $1\frac{1}{2}$ to 2 lines long, abruptly acuminate, pubescent.

Apparently restricted to California, from Santa Cruz southward, and very rare: Santa Cruz, *Lemmon*, *Anderson*; also reported from near Los Angeles by Dr. Anstruther Davidson.

6. **P. amethystina** Trin. PURPLE CANARY-GRASS. Perennial; stems stout, erect, usually 4 to 8 ft. high, often growing in large clumps; ligule 2 to $3\frac{1}{2}$ lines long, obtuse; blades $2\frac{1}{2}$ to $8\frac{1}{2}$ in. long, 4 to 6 lines wide; margins scabrid; peduncle long, slender; thyrses $1\frac{1}{2}$ to $3\frac{1}{4}$ in. long, about $\frac{3}{4}$ in. broad, ovate or ovoid, usually purplish; spikelets 3 to $3\frac{1}{2}$ lines long; bracts strongly keeled but not winged, acute, glabrous except for the scabrid keel; empty bractlets $1\frac{1}{2}$ to $1\frac{3}{4}$ lines long, hirsute except on the nerve, which is shining; flower-enclosing bractlet 2 to $2\frac{1}{2}$ lines long, acuminate, shining, sparsely hairy.

Moist places in the Coast Ranges from Mendocino Co. southward: San Francisco; Lake Pillsbury; Angel Island; Mill Valley and Bear Valley, Marin Co.; Point Isabel and Berkeley. Reported also from Bolinas Bay and Napa Valley by Bolander. Apr.—June.

7. **P. arundinacea** L. REED CANARY-GRASS. Perennial; root-stock creeping; stems stout, erect, usually 3 to 6 ft. high; sheaths scarcely inflated; ligule broad, clasping the stem, about 2 lines long, blades 4 to 12 in. long, 3 to 7 lines wide, smooth; panicle 3 to 6 or 9 in. long, often purplish, and much interrupted or lobed; branches few at a node, the lower $\frac{1}{2}$ to 2 in. long; bracts linear-lanceolate, strongly keeled, scabrid; empty bractlets 2, narrow, hairy, about $\frac{1}{2}$ the length of the flower-enclosing bractlet; the latter about $1\frac{1}{2}$ lines long, acuminate, sub-glabrous and shining.

Moist places beside streams and sloughs: reported as collected near Sacramento by the Wilkes expedition, *Bot. Cal.*, and at Niles, *Behr*; Upper Lake, Lake Co. and Bakersfield, *Dary*. Beal states that it is often called "Crazy-grass" in the Northwest, as it is thought to be injurious to horses.

6. **ANTHOXANTHUM** L. SWEET VERNAL-GRASS.

Leaf-blades flat. Panicle cylindrical, spike-like. Spikelets 1-flowered; bracts thin, herbaceous, persistent, keeled, lower 1-nerved, upper about twice its length and 3-nerved; flower perfect, terminal, subtended by 2 empty dorsally awned bractlets which are clothed with brown hairs and are smaller than the bracts; rachilla jointed above the bracts. Flower-enclosing bractlet and palea alike, awnless, smooth, obtuse, at first hyaline, then chartaceous; bractlet enveloping the palea, with 3 very fine nerves; palea narrower, with 1 very fine central nerve or keel. Scales obsolete. Stamens 2; anthers large, yellow. Ovary glabrous; styles long, distinct; stigmas long. (Greek *anthos*, a flower, *xanthos*, yellow, in allusion to the yellow tint given to the spikelets by the brightly colored anthers. Becoming fragrant in drying.)

1. **A. odoratum** L. SWEET VERNAL-GRASS. Perennial; stems $\frac{1}{2}$ to 2 ft. high, shining; sheaths furrowed, glabrous or pubescent, hairy at the mouth; blades often sparingly hairy, $1\frac{1}{2}$ to 6 in. long; panicle 1 to $1\frac{1}{2}$ (rarely 5) in. long, contracted, sometimes interrupted below; branches very short; spikelets 3 to 4 lines long, sub-sessile, often yellowish-green; lower bract ovate, acute, about 2 lines long,

hyaline; upper lanceolate, awn-pointed, about $4\frac{1}{2}$ lines long; empty bractlets curved, emarginate or shortly bifid, $1\frac{1}{2}$ lines long; awn short; stigmas long-exserted.

Introduced at Mendocino City and Crescent City, and reported by Dr. Behr as occurring in Marin Co. May-July. Its fragrance is attributed to the presence of cumarin.

7. **HIEROCHLOE** Gmel. **VANILLA-GRASS.**

Sweet-scented perennials, with flat, often broad, acuminate leaf-blades. Panicle loose, pyramidal. Spikelets somewhat laterally compressed, often shining and scabrid, with 1 terminal, perfect flower, subtended by (in ours) 2 staminate ones; bracts about equal, obscurely 1 to 3-nerved, keeled, acute, glabrous. Staminate flowers sessile; bractlet and palea alike, villous, scarcely shorter than the bracts, obtuse emarginate or bifid, keeled, the main nerve often extending into a short awn; bractlet 5-nerved; palea 2-nerved; stamens 3. Perfect flower shortly pedicellate; bractlet becoming indurated above, awnless, 5-nerved; palea narrow, 3-nerved or nerveless beyond the keel; stamens often 2 only. Scales 2, lanceolate. Ovary smooth. (Greek hieros, sacred, chloe, a grass, with reference to the use of one species in north Europe for strewing church floors on special occasions, on account of its fragrance when crushed.)

1. **H. macrophylla** Thurb. **LARGE-LEAVED VANILLA-GRASS.** Rootstocks in bunches (sometimes very large), stoloniferous; stems 1 to 2 ft. high, erect, leafy; panicle narrow, 3 to 6 in. long, lax and open; branches 1 or 2 at a joint, bearing few, large spikelets with spreading bracts; spikelets about 2 lines long, 2 to 3 lines wide when open, brownish, brightly shining; anthers yellow, about 1 line long.—(*Savastana macrophylla* Beal.)

In light, loose soil on moist, shaded banks of coniferous forests in the redwood belt, from Marin Co. northward: Paper Mill Creek, Marin Co., *Bolander* in 1864; Inverness and Bear Valley near Olema; Mill Valley; Russian River from Duncan's Mills to Guerneville; Austin Creek and Turner Cañon. Mar.-May. Said to owe its fragrance to the presence of cumarin; it has been known to retain some of its odor for fully thirty years after gathering.

TRIBE 4. **Agrostideæ.** **BENT-GRASS TRIBE.**

Inflorescence paniculate or rarely racemose, often cylindrical dense and spike-like. Spikelets all fertile, strictly 1-flowered. Flower always perfect, either terminal, or sometimes the rachilla prolonged beyond its insertion, as a bristle. Rachilla jointed above the bracts (except in *Alopecurus* and *Polypogon*) so that these persist after the flower falls. Bracts usually equaling or exceeding the bractlet. Palea 2-nerved or nerveless, in some species of *Agrostis* and *Alopecurus* minute or obsolete.

Bractlet indurated at maturity (at least firmer in texture than the bracts) and very closely enveloping the fruit; panicle (in ours) lax.

Bractlet narrow; awn persistent, twisted, stout 8. **STIPA.**

Bractlet usually hyaline or membranous at maturity (at least not remarkably firmer in texture than the bracts); panicle various, but usually contracted, dense and spikelike.

Pedicle jointed below the bracts, so that these fall away with the flower at maturity, sometimes together with the whole or a part of the pedicle.

Bracts awnless 10. *ALOPECURUS*.

Bracts long-awned 11. *POLYPOGON*.

Pedicle not jointed below the bracts; rachilla jointed above the bracts so that these persist after the flower has fallen.

Spikelets 3 lines or less long.

Rachilla naked or with a few very short hairs.

Bracts strongly keeled.

Bracts abruptly acute, complicate, ciliate fringed on the keels 9. *PHLEUM*.

Bracts acuminate, saccate at the base, two-thirds longer than the bractlet 13. *GASTRIDUM*.

Bracts not keeled; acute or acuminate; very small 12. *AGROSTIS*.

Rachilla with a tuft of long hairs on the callus, about $\frac{1}{2}$ the length of the bractlet 14. *CALAMAGROSTIS*.

Spikelets 5 to 6 lines long; bractlet and palea chartaceous; a tall sand-dune grass 15. *AMMOPHILA*.

8. *STIPA* L.

Rootstock tufted. Leaf-blades narrow, involute or convolute. Panicle lax, mostly open or somewhat contracted. Spikelets 1-flowered. Bracts subequal, keeled, often terminated by a long subulate point, persistent; rachilla jointed above the bracts. Bractlet and palea dissimilar; bractlet firm, narrow, rolled around the flower, with a terminal, undivided, bent, persistent awn, spirally twisted below the bend; palea usually shorter, thinner, 2-nerved. Scales usually 3 and large. Stamens usually 3, rarely only 1 or 2; anthers often tipped with a tuft of short hairs. Ovary stipitate, smooth; styles 2, short; stigmas plumose with simple hairs. (Greek stipe, feathery, referring to the long, feathery awns of some species. Ours usually met with on dry hillsides. One of the several genera known as "Bunch-grasses.")

Awn $2\frac{1}{2}$ to 4 in. long 1. *S. setigera*.
Awn less than 2 in. long.

Panicle open, branches spreading; anthers tipped with a tuft of short hairs.

2. *S. eminens*

var. *Andersoni*.

Panicle strict, narrow; branches short, erect; anthers naked . . . 3. *S. viridula*.

1. *S. setigera* Presl. BEAR-GRASS. Perennial; stems erect, 1 to 3 ft. high, slender; panicle 5 to 12 in. long, open, nodding in flower; branches in pairs, slender, bearing a few drooping spikelets; bracts 6 to 10 lines long, long-acuminate; bractlet 3 lines long, silky-hairy sometimes all around below, but only on the nerves above, minutely tuberculate; awn stoutish, $2\frac{1}{2}$ to 4 in. long, hairy below.

Common on dry hillsides from Mendocino Co. southward: Berkeley hills; San Francisco. Mar.-June.

2. *S. eminens* Cav. var. *Andersoni* Vasey. ANDERSON'S *STIPA*. Perennial; stems erect, 1 to 3 ft. high, slender; panicle 2 to 5 in. long, open, nodding in flower; branches in pairs, very short, slender, spreading, bearing few drooping spikelets; bracts 3 to 4 lines long, acuminate; bractlet about 3 lines long, silky-hairy all over; awn

slender, about 1 in. long, scabrid but not hairy; anthers tipped with a tuft of short hairs.

Dry hillsides of the Coast Ranges and foothills: Oakland hills; Berkeley; Stone Bridge near St. Helena. Apr.-June. Frequently occurring in company with *S. setigera* and sometimes confused with it, but at once distinguishable by the shorter bracts and awn. The home of the typical *S. eminens* Cav. is Ecuador, and it is said to occur also in southern California and Arizona.

3. *S. viridula* Trin., FEATHER BUNCH-GRASS, a perennial with dense, narrow panicle and short, erect branches, and with naked anthers, is found in the northern Coast Ranges and the middle Sierra Nevada; reported from the vicinity of San Francisco by Dr. Behr.

9. PHLEUM L. TIMOTHY.

Ours perennial. Leaf-blades flat. Inflorescence a dense, cylindrical or ovoid thyse or false spike, often pubescent, borne on a long peduncle. Spikelets crowded, 3 lines or less long, much compressed laterally, 1-flowered. Rachilla very short, jointed above the bracts and sometimes extending beyond the insertion of the bractlet as a short spine. Bracts distinct, complicate, boat-shaped, almost equal, membranous, 1 to 3-nerved, sub-truncate, persistent, compressed-keeled, the keel projecting into an abrupt mucro or very short awn. Bractlet shorter than the bracts, awnless, very thin, truncate or denticulate. Palea narrow, hyaline, 2-nerved, sometimes bearing a minute bristle on the back from near the base. Scales 2, hyaline, toothed above. Stamens 3. Ovary smooth; styles long; stigmas slender. (Phleos, the ancient Greek name for some marsh or water-plant, possibly the Reed-mace—*Typha*, or *Saccharum cylindricum* Lam.)

Panicle narrowly cylindrical, elongated, $1\frac{1}{2}$ to $9\frac{1}{2}$ in. long, rough to the touch, not feathery; spikelets about $1\frac{1}{2}$ lines long including the awn 1. *P. pratense*.

Panicle ovoid or oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, feathery; spikelets about $2\frac{1}{2}$ lines long including the awn 2. *P. alpinum*.

1. *P. pratense* L. TIMOTHY. Rootstock tufted, stoloniferous; stems sub-solitary or tufted, erect, leafy, 1 to 4 ft. high, simple, bright green; lower internodes often swollen and corm-like; sheaths glaucescent, striate, smooth; ligule brownish, $1\frac{1}{2}$ to 2 lines long, abruptly acute; blades $2\frac{1}{2}$ to 3 lines wide, minutely scabrid, especially on the edges, glaucescent; panicle $1\frac{1}{2}$ to 9 in. long, about 3 lines wide, rough to the touch, not feathery; spikelets about $1\frac{1}{2}$ lines long including the awns, rigid, pale green or purplish; bracts about 1 line long, hyaline except the nerves; nerves 3, converging above into a divergent, scabrous mucro about $\frac{1}{2}$ line long, the central nerve pectinate-ciliate; margins of the bract abruptly truncate below the mucro; bractlet about 1 line long, broad, completely enfolding the narrow palea, faintly 5 to 7-nerved and toothed; palea faintly 2-nerved, emarginate; anthers about 1 line long and yellow before shedding the pollen, afterwards shrunken and lavender-colored.

Introduced into N. America as a forage grass, and now extensively

naturalized in the United States and British America: Glen Ellen, Sonoma Co.; flats along the Russian River near Guerneville. June-Aug.

2. *P. alpinum* L. MOUNTAIN TIMOTHY. Closely related to *P. pratense* but stems rarely more than a foot high, usually stouter and more leafy, slightly decumbent at base; internodes not corm-like; uppermost sheaths inflated; ligule about 1 line long, truncate; leaf-blades short, acute, $1\frac{1}{2}$ to 5 lines wide; panicle ovoid or oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, feathery, usually darker in color; spikelets about $2\frac{1}{2}$ lines long including the awns; margins of bracts less abruptly truncate; anthers about $\frac{3}{4}$ line long.

Sierra Nevada and the higher Coast Range Mountains; also on dry, sandy bluffs along the coast from Crescent City to San Francisco: dry hills near Fort Point, *Bolander*, 1862; Bodega Point, *Eastwood*; Point Reyes. Apr.-Aug.

10. *ALOPECURUS* L. FOX-TAIL.

Aspect much that of *Phleum*. Upper sheaths usually inflated; leaf-blades flat. Inflorescence a dense, cylindrical or ovoid, terminal thyse or false spike, which is soft to the touch and jointed on the apex of the enlarged peduncle. Spikelets 1-flowered, crowded, 3 lines or less long, much compressed laterally. Bracts somewhat united at the base, conduplicate, compressed-keeled, deciduous with the flower; keel ciliate-fringed or slightly winged. Rachilla not jointed above the bracts. Flower decidedly proterogynous. Bractlet and palea hyaline, equaling or barely shorter than the bracts; bractlet broad, obtuse, 1 to 3 or 5-nerved, with a short, very slender, bent awn on the back, at, or below, the middle; margins connate at the base, enclosing the flower; palea usually obsolete, when present narrow, acute, keeled, partly included by the bractlet. Scales obsolete. Stamens 3. Ovary smooth; stigmas long, shortly hairy with simple hairs. (Greek *alopex*, a fox, *oura*, a tail, from the fancied resemblance of the thyse to a fox's tail. Closely resembling and nearly allied to *Phleum*. The name "Fox-tail" has frequently been applied, in California, to the Barley-grasses, species of the genus *Hordeum*.)

Spikelets $2\frac{1}{2}$ to 3 lines long; thyse $2\frac{1}{2}$ to $3\frac{1}{4}$ in. long. 1. *A. pratensis*.

Spikelets $1\frac{1}{2}$ to 2 lines long; thyse 1 to 2 in. long, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines wide. 2. *A. Californicus*.

Spikelets 1 to $1\frac{1}{2}$ lines long; thyse $\frac{3}{4}$ to 1 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide. 3. *A. geniculatus*.

1. *A. pratensis* L. MEADOW FOX-TAIL. Rootstock perennial, stoloniferous; stems erect or the lowest node geniculate, smooth; sheaths smooth, upper much inflated; ligule $\frac{1}{2}$ to $1\frac{1}{2}$ lines long, entire, truncate, brown, scabrid; blades $1\frac{1}{2}$ to 3 lines wide; panicle slender, dense, cylindrical, obtuse, $2\frac{1}{2}$ to $3\frac{1}{4}$ in. long, soft, pale green or purplish; branches very short, with 3 to 6 spikelets; spikelets $2\frac{1}{2}$ to 3 lines long, 1 line broad, narrowly oval, much compressed, acute; bracts acute, villously ciliate on the keel; margins connate for about $\frac{1}{4}$ to $\frac{1}{5}$ their length; bractlet awned from near the base; margins connate

for $\frac{1}{3}$ to $\frac{1}{4}$ their length; awn about 4 lines long, exserted $\frac{1}{2}$ its length.

Introduced from Europe, and found not infrequently near settlements, but apparently nowhere plentiful; Waverly, *Sanford*. Apr.—July.

2. **A. Californicus** Vasey. CALIFORNIA FOX-TAIL. Perennial, allied to *A. pratensis*, but the thyse only 1 to 2 in. long; spikelets $1\frac{1}{2}$ to 2 lines long; bracts obtuse, only slightly united at the base and often ciliate for only two-thirds of their length; awn exserted $1\frac{1}{2}$ to 2 lines, mostly strongly geniculate; anthers bright yellow.

Apparently peculiar to California and Oregon. Wet places; Santa Cruz Co., *Dr. Anderson*; Berkeley, *Bioletti*. May.

3. **A. geniculatus** L. WATER FOX-TAIL. Perennial; stems procumbent and rooting from the lower nodes, then ascending 1 to $1\frac{1}{2}$ ft., smooth; sheaths smooth, upper inflated; ligule 1 to $1\frac{1}{2}$ lines long; blades $\frac{1}{2}$ to $1\frac{1}{2}$ lines wide; panicle slender, dense, cylindrical, obtuse, $\frac{3}{4}$ to 1 in. long; branches very short, with often only 1 spikelet; spikelets 1 to $1\frac{1}{2}$ lines long, truncate; bracts silky, especially on the keel, obtuse, broadly scarious; bractlet glabrous; margins united $\frac{1}{2}$ way up; awn about 2 lines long, exserted $\frac{1}{2}$ its length; anthers purplish.

Introduced in wet meadows, ditches, and marshy or springy places; collected on the State Survey by Bolander but locality not stated; near the Fish Hatchery, Bear Valley, Marin Co, *Davy*. Apr.—Sept.

Var. **aristulatus** Torr. (var. **fulvus**, Scribn.) WILD WATER FOX-TAIL, is said to differ mainly in being glaucous; sheaths more inflated; blades broader; panicle longer (often 2 in.) and paler, and the bracts still more obtuse; awn very short, barely exserted, inserted near the middle of the bractlet; anthers shorter, yellow, oblong.—In wet places, apparently indigenous. Reported from the Klamath Marshes. *Bigelow*, *Lemmon*, and Marin Co., *Behr*.

Var. **robustus** Vasey, is described as more robust; stems stouter, though apparently not taller than the typical species; ligule 2 lines long; blades 3 lines wide; panicle 2 to 3 in. long, 3 to 4 lines wide.—Said to have been collected in California by *Lemmon* in 1874 and *Rattan* in 1884, but localities not mentioned. The type specimens were from Alaska and Vancouver Island.

11. POLYPOGON Desf. BEARD-GRASS.

Stems solitary or tufted, decumbent at base. Blades flat. Panicle contracted. Spikelets 1-flowered, rarely exceeding a line in length, jointed on the pedicel below the bracts so that these fall away with the flower at maturity. Bracts sub-equal, keeled, bifid or notched, with a terminal straight awn at or below the apex, 1-nerved, deciduous. Bractlet awned or not; palea smaller, 2-nerved. Scales 2, falcate, entire, as long as the ovary. Stamens 3; anthers small. Ovary glabrous; styles short, free; stigmas long, feathery. (Greek *polus*, many, *pogon*, a beard, referring to the numerous awns; these give a bristly appearance to the inflorescence.)

Annual; panicle dense, not distinctly lobed or interrupted, except below; awns 2 to $3\frac{1}{2}$ lines long 1. *P. Monspeliensis*.
 Perennial; panicle much interrupted or distinctly lobed; awns about 1 line long 2. *P. littoralis*.

1. *P. Monspeliensis* (L.) Desf. TAWNY BEARD-GRASS. Annual; rootstock tufted; stems a few inches to 2 or even 3 ft. high, leafy; panicle dense, not distinctly lobed or interrupted except sometimes below, $1\frac{1}{2}$ to 4 in. long, often of a tawny tinge; spikelets very numerous, nearly hidden under the slender awns; awns 2 to $3\frac{1}{2}$ lines long; bracts scabrid, deeply notched; bractlet truncate-dentate.

Native of Europe. Abundant throughout the State, especially in moist places: Martinez, Berkeley, Oakland, San Francisco and Point Reyes. Apr.-Aug., or in wet places even to Oct.

2. *P. littoralis* Smith. WATER BEARD-GRASS. Perennial; rootstock solitary; stems weak, ascending, geniculate at the lower nodes, 1 to 2 ft. high; panicle much interrupted or distinctly lobed, 2 to 5 or rarely 6 in. long, somewhat shining, often purplish; branches in dense whorls, very irregular; spikelets not concealed by the awns; awns about 1 line long; bractlet awned.

Introduced and common in moist localities along the coast: San Francisco, Berkeley, etc. Apr.-Aug. Closely resembling *Agrostis verticillata*, but at once distinguished by the presence of awns.

12. AGROSTIS L. BENT-GRASS.

Leaf-blades flat. Panicle-branches whorled, often in clusters of several, filiform. Spikelets very numerous, small, $1\frac{1}{2}$ to 2 lines long, strictly 1-flowered. Bracts narrow, keeled, acute or acuminate, awnless or almost awn-pointed, persistent; lower somewhat longer than the upper. Rachilla not distinctly prolonged beyond the insertion of the flower, jointed below the bractlet; callus very short, naked, or with a few short hairs. Bractlet mostly shorter than the bracts, very thin, broad, 3 to 5-nerved, obtuse or truncate and toothed, awnless or with a slender, straight, twisted awn on the back usually much below the apex. Palea rarely more than $\frac{1}{2}$ the length of the bractlet, often very minute or obsolete. Scales 2, entire, minute. Stamens mostly 3. Styles very short, free; stigmas feathery. (*Agrostis*, the Greek name for a grass which mules fed on, perhaps derived from *agros*, a field, having reference to the habitat of some species.)

Palea conspicuous, $\frac{1}{2}$ to $\frac{3}{4}$ the length of its bractlet.

Rootstock stoloniferous; panicle open, 6 to 8 inches long; palea $\frac{1}{4}$ to $\frac{1}{2}$ shorter than its bractlet 1. *A. alba*

var. *stolonifera*.

Rootstock not stoloniferous; panicle interrupted but dense, $\frac{1}{2}$ to 4 in. long; palea about equaling its bractlet 2. *A. verticillata*.

Palea obsolete, or, if present, minute.

Rootstock tufted, not at all stoloniferous; panicle dense and rigidly erect; spikelets 1 line long.

Panicle narrowly oblong, dense, 2 to 4 in. long, 5 to 9 lines wide; bractlet awned; awn about 1 line long 3. *A. densiflora*.

Panicle linear, 4 to 6 in. long, 3 to 4 lines wide; bractlet awnless 4. *A. asperifolia*.

Rootstock slender and creeping; panicle narrow, not dense and not rigid; spikelets $1\frac{1}{2}$ lines long.

Panicle $2\frac{1}{2}$ to 5 in. long; bractlet awnless 5. *A. Diegoensis*.

1. *Agrostis alba* L. var. *stolonifera* Auct. CREEPING BENT. Perennial, stoloniferous and sometimes forming a dense turf; stems decumbent at base, and rooting at the lower nodes then erect, 1 to 3 ft. high; sheaths scabrid or almost smooth; ligule $1\frac{1}{2}$ lines long, obtuse; blades 3 to 6 in. long, $1\frac{1}{2}$ lines wide, acute, antrorsely scabrous; panicle open, 6 to 8 in. long, narrow; branches sub-erect in $\frac{1}{2}$ whorls, the longest about 2 in. long, branched and spikelet-bearing to near the base; rachis and pedicels scabrous, the latter distinctly clavate; spikelets about 1 line long; bracts sub-equal, narrow, acute, scabrous on the solitary nerve, widely gaping when dry; callus with a tuft of minute hairs on each side; bractlet awnless, narrow-lanceolate, $\frac{3}{4}$ to 1 line long, minutely 3-toothed; nerves very indistinct; palea distinct, about $\frac{1}{2}$ line long; stamens 3; anthers $\frac{1}{2}$ line long.—(*A. stolonifera* L. ?)

Native of Europe, introduced as a pasture grass and naturalized in several localities, preferring moist situations; flats along the Russian River near Guerneville, 1896. July.

2. *A. verticillata* Vill. WHORLED BENT-GRASS. Perennial; rootstock not stoloniferous; stems decumbent, 1 to 2 ft. high, rooting from the lower nodes; sheaths inflated, smooth; ligule 1 to 2 lines long, obtuse, scabrid; blades 2 to 4 in. long, 1 to 3 lines wide, scabrid above; panicle loosely contracted, $1\frac{1}{2}$ to 4 in. long, 4 to 6 lines wide; branches sub-erect, whorled, the longest about 1 line long and naked at the base, the rest spikelet-bearing from the base up; spikelets 1 line long, obtuse; bracts subequal, obtuse, 1-nerved, scabrid; callus apparently naked; bractlet $\frac{1}{2}$ line long, 5-nerved and prominently 5-toothed, glabrous; palea conspicuous, almost equaling the bractlet, 2-nerved; stamens 3.

Native of S. Europe. Common in wet places beside springs and streams: San Francisco, 1866, *Bolander*; Stege, Berkeley, and Agnews to the Upper San Joaquin Valley and Southern California; perhaps introduced. May-Oct. Resembles *Polypogon littoralis*, but at once distinguished by the absence of awns.

3. *A. densiflora* Vasey. SEA BENT. Apparently annual; stems erect or ascending from a decumbent base, 3 to 12 in. high, stout, leafy; sheaths loose and inflated, smooth or scabrid; ligule 1 to 2 lines long, truncate; blades 2 to 4 in. long, 2 to $3\frac{1}{2}$ lines wide, obtuse, scabrous; panicle narrowly oblong, dense, lobed, 2 to 4 in. long, 5 to 9 lines wide, rarely interrupted at the base; branches crowded, erect, whorled or the lowest in $\frac{1}{2}$ whorls, all but the longest densely crowded with spikelets from the base up; longest $\frac{1}{2}$ to 1 in. long; spikelets $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; bracts sub-equal, narrow, acuminate-pointed, 1-nerved, scabrous especially on the nerve; callus with a tuft of minute hairs at the base of each margin of the bractlet; bractlet 1 line long, glabrous, minutely toothed at the apex, 5-nerved below, midnerve excurrent from a little below the apex as a scabrid

awn about 1 line long; palea obsolete or minute; stamens 3.—(*A. mucronata* Thurb. in Bot. Cal.; *A. densiflora* var. *arenaria* Vas.)

Along the coast from Santa Cruz to Fort Bragg; moist sandy places on the cliffs, mouth of Bear Valley, Marin Co. July–Aug.

4. *A. asperifolia* Trin. NORTHERN RED-TOP. Annual; stems stiffly erect, tufted, stout, leafy, 1 to 2 ft. high; sheaths minutely scabrid, margins scabrous; ligule 1 to 2 lines long, truncate or obtuse, more or less decurrent; blades 3 to 6 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide, acuminate or acute, scabrous; panicle shortly exserted, linear, interrupted below, lobed and dense above, 4 to 6 in. long, 3 to 4 lines wide; branches crowded, erect, densely whorled and some at each node densely spikelet-bearing from the base, the longest $\frac{3}{4}$ to $1\frac{1}{2}$ in. long and naked below; spikelets $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; bracts sub-equal, narrow, acuminate 1-nerved, scabrous only on the nerve; callus with a tuft of minute hairs at the base of each margin of the bractlet, or apparently naked; bractlet $\frac{3}{4}$ line long, glabrous, minutely toothed at the apex, faintly nerved, awnless; palea obsolete or minute; stamens 3.—(*A. exarata* Thurb. in Bot. Cal., in part.)

Apparently near to *A. densiflora*, but at once distinguished from it by the taller stem, longer and narrower leaves and panicle, and the absence of awns. Common in the San Francisco Bay Region in salt-marshes and other wet places: N. Berkeley; Lake Pilarcitos; Baden; San Francisco; Martinez. June.

5. *A. Diegoensis* Vasey. SAN DIEGO BENT-GRASS. Rootstock perennial, slender, stoloniferous; stems slender, erect, 2 to $2\frac{1}{2}$ ft. high; sheaths minutely scabrid; ligule 3 to 4 lines long, sparingly serrate, decurrent; blades $2\frac{1}{2}$ to 7 in. long, 1 line wide, antrorsely scabrous especially on the margins; panicle narrow, lax, well exserted, $2\frac{1}{2}$ to 5 in. long; branches erect, the longest $1\frac{1}{2}$ to 3 in. long, all but the longest spikelet-bearing to near the base; spikelets $1\frac{1}{2}$ lines long; bracts acute, sub-equal, scabrid; callus with a prominent tuft of hairs about $\frac{1}{2}$ lines long, at the base of each margin of the bractlet; bractlet awnless, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long, scabrid especially on the margins above, emarginate or shortly 2-fid, and 4-toothed, prominently 5-nerved, the mid-nerve not reaching the apex; palea minute or obsolete; stamens 3; anthers 1 line long, purplish.

Abundant in the shade of bushes on dry hillsides of the Coast Ranges from San Diego to Sonoma Co.: Berkeley hills; Hood's Peak; Olema; Point Reyes. June–Aug. One of our most abundant native grasses.

13. *GASTRIDIMUM*. Beauv.

Erect annual. Leaf-blades flat. Panicle spike-like, contracted, cylindric-fusiform, shining. Spikelets small, 1-flowered. Bracts much exceeding the bractlet, the lower much the longer, shining, gibbous at the base, keeled above, acute or awn-pointed. Rachilla prolonged beyond the insertion of the flower. Bractlet and palea equal, alike, minute, hyaline, shortly stipitate and with a tuft of very minute hairs at the base; bractlet truncate, toothed, with or

without a slender, twisted, dorsal awn which equals or exceeds the bracts; palea narrow. Scales 2, oblong, entire, as long as the ovary. Stamens 3. Stigmas sub-sessile. (Greek gastrideon, a ventricle, having reference to the ventricose bases of the bracts.)

1. *G. lendigerum* (L.) Gaudin. NIT-GRASS. Stems tufted, erect from a geniculate base, 6 to 24 in. high, branching at the lower nodes; sheaths slightly rough; ligule about 2 lines long, lacerate-fringed; blades 2 to 5 in. long, about 2 lines wide, long-pointed, scabrous on both sides, pale green; panicle 3 to 6 in. long, about $\frac{1}{2}$ in. wide, in large specimens somewhat lobed, very pale green, shining with a satiny luster; pedicels clavate; spikelets about 2 lines long, very acute; bracts somewhat scabrous above; bractlet hairy, white, shining, 4-toothed; awn from just below the apex, very slender.—(*G. australe* Beauv.)

Native of the Mediterranean Region, also found in Chile; introduced in California, and common near the coast: Petaluma; Briones Hills; Berkeley, and northward and southward. June-Oct.

14. CALAMAGROSTIS Adans. REED BENT-GRASS.

Stems tall, often reed-like. Panicle-branches whorled. Spikelets 1-flowered; rachilla jointed above the bracts, shortly prolonged beyond the insertion of the flower and bearing a tuft of long, white, silky hairs, which in all of ours are much shorter than the bractlet. Bracts enclosing the bractlet, sub-equal, concave, acuminate, awnless; upper 3-nerved. Bractlet hyaline, 3 to 5-nerved, truncate, 2-fid, toothed, in ours awned at the tip or on the back with a twisted, strongly geniculate, conspicuously exerted awn. Palea small, 2-nerved. Scales 2, entire, acute. Stamens 3. Ovary glabrous; styles short, distinct; stigmas feathery. (Greek kalamos, a reed, agrostis, grass, with reference to the reed-like habit of some species.)

In the absence of an adequate series of specimens the following key has been adapted from that prepared by Kearney in his Revision of the N. American species of the genus, in Bull. 11, of the U. S. Dep. of Agriculture, Division of Agrostology.)

Awn greatly exceeding the bracts.

Strongly caespitose, rather hard in texture; leaf-blades strongly involute; panicle dense, branches appressed 1. *C. purpurascens*.

Awn shorter than, or not much exceeding the bracts.

Spikelets strongly compressed; bracts sharply keeled; plant tall; leaf-blades not filiform.

Panicle wide, not spikelike, usually loose; leaves often flat 2. *C. Aleutica*.

Panicle narrower and dense, spike-like; leaves all strongly involute.

Panicle strict, spikelets about 3 lines long 3. *C. angusta*.

Panicle usually somewhat flexuous; spikelets 2 to $2\frac{1}{2}$ lines long; awn arising from near the base of the bractlet 4. *C. sub-flexuosa*.

Spikelets not strongly compressed; bracts not strongly keeled; plant caespitose; stems usually somewhat rigid; leaf-blades usually filiform.

Lower leaves in a dense tuft, short, rather rigid, strongly involute; spikelets about $3\frac{1}{2}$ lines long 5. *C. fasciculata*.

Lower leaves rarely forming a dense tuft, usually elongated, not rigid; panicle narrow, spiciform, usually red-purple . . 6. *C. rubescens*.

1. *C. purpurascens* R. Br. PURPLE REED-GRASS. Rootstock

perennial, strongly tufted; stems erect, 1 to 2 ft. high, rather hard in texture; ligule about 1 line long, lacerate; blades strongly involute and scabrous; panicle very dense, spikelike, often slightly interrupted below, 3 to 4 in. long, varying from pale to dark purple; branches usually in fives below, appressed, the longest not more than an inch long; spikelets 3 to $3\frac{1}{2}$ lines long; bracts sub-equal, very acute; upper distinctly 3-nerved; callus hairs unequal, the longest, at the sides, about $\frac{1}{4}$ the length of the bractlet; awn arising from very near the base of the bractlet, exerted more than $\frac{1}{2}$ the length of the bracts.—(C. *sylvatica*, Thurb. in Bot. Cal., not of DeCandolle. Description adapted from that of Thurber, in the absence of specimens. Reported as having been collected by Bolander in the "redwoods," but the actual locality is not stated; perhaps not within our limits, but to be looked for.)

2. **C. Aleutica** Bong. ALEUTIAN REED-GRASS. Stems stout, erect, 2 to 5 ft. high; sheaths minutely scaberulous; blades 6 to 12 in. long, 3 to 5 lines wide, scabrid on both surfaces, margins scabrous; panicle 6 to 10 in. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. broad, loosely contracted and somewhat interrupted, somewhat drooping above; branches erect, some at each node spikelet-bearing from the base; spikelets acute; lower bract $1\frac{1}{2}$ to $3\frac{1}{2}$ lines long, glabrous except the scabrid keel; upper rather shorter, bractlet $2\frac{1}{2}$ to 3 lines long; awn from near the middle of the bractlet and barely equaling it, usually strongly geniculate; anthers 1 to $1\frac{1}{2}$ lines long.

Along the seashore in rocky or marshy places, from Point Reyes northward. June–July. A tall, coarse species, forming large tufts.

3. **C. angusta** Kearney. NARROW REED-GRASS. Perennial; stems few, slender, $2\frac{1}{2}$ to $3\frac{2}{3}$ ft. high; ligule about 2 lines long, apex broad, truncate or rounded; blades not filiform, all strongly involute, at least above; panicle spikelike, narrow and dense, strict, $4\frac{1}{2}$ to 7 in. long, sometimes interrupted below; branches short, appressed, the lower in threes; spikelets densely crowded, about 3 lines long, strongly compressed; bracts subequal, rather sharply keeled; awn from near the base of the bractlet, and shorter than, or not much exceeding, the bracts, $1\frac{1}{2}$ lines long, stout; anthers $1\frac{1}{2}$ lines long.

The type, which appears to be the only specimen so far known, is from Santa Cruz, *Anderson*. Description adapted from that of Kearney in the absence of specimens.

4. **C. sub-flexuosa** Kearney. FLEXUOUS REED-GRASS. Stems tufted, slender, erect, 2 to 3 ft. high; sheaths minutely scabrid; ligule 1 to 2 lines long, apex slightly truncate; blades strongly involute, but not filiform, panicle 4 to 6 in. long, oblong-lanceolate, narrow and dense, almost spiciform, often interrupted or lobed below, usually somewhat flexuous, brownish-purple; branches erect, in fours or sixes below, the longest about 2 in.; spikelets crowded, 2 to $2\frac{1}{2}$ lines long, strongly compressed; bracts subequal, about $2\frac{1}{2}$ lines long, sharply keeled, glabrous except the scabrid keel; bractlet and palea minutely 5-toothed; awn from a little above the base of the bractlet, about equaling the bracts, stout; anthers 1 line long.

The type is Bolander's no. 2274 from the Oakland Hills and the species does not appear to have been re-collected. It resembles *C. Aleutica*, but is said to be at once distinguishable by the short and narrow involute leaves and by the position of the awn.

5. *C. fasciculata* Kearney. A perennial "bunch-grass;" densely tufted from a scaly, stoloniferous rootstock; stems 2 to 2½ ft. high, stout, erect from a decumbent base, very leafy and densely clothed with the old, dry sheaths; the lowest sheaths bearded at the junction with the blade; ligule 1½ lines long, serrate; blade about 1 line wide, flat or becoming involute, minutely scabrid, uppermost cauline ¾ to 1¼ in. long, lowest cauline 5 to 6 in., those of the sterile shoots 6 to 10 in. long; panicle shortly exserted, narrowly lanceolate or almost linear, 2 to 4 in. long, 3 to 4 lines wide, interrupted below, dense and lobed above; branches short, appressed, densely-flowered to the base; longest ½ to ¾ in. long; spikelets ¾ line long; bracts subequal, acute, scabrous; the upper the longer, about 2½ lines long; prolongation of the rachilla minute, naked; bractlet exceeding the bracts, 3 lines long, prominently nerved; awn arising about ⅔ from the base, 1½ lines long, shortly exceeding the bractlet; palea about 2 lines long.

Marin Co. northward: plentiful along the trail from Mill Valley Cascades to the reservoir, above the redwoods. Aug.-Sept.

6. *C. rubescens* Buckl., which is described by Kearney as differing from *C. fasciculata* in its usually elongated, not rigid, leaves which rarely form a dense tuft, and further by its narrow, spiciform, usually red-purple panicle, is recorded by him as having been collected on Mt. Tamalpais by Blankinship.

15. *AMMOPHILA* Host.

Tall perennial, with long, rigid leaves. Panicle large, contracted. Spikelets large, 1-flowered, much compressed laterally. Bracts persistent, scarcely exceeding the bractlets, sub-equal, rigid, thick, compressed-keeled, lanceolate, sub-acute, awnless; lower 1, upper 3-nerved. Rachilla terminating in a point beyond the insertion of the bractlet. Bractlet and palea similar in texture and about as long as the bracts; bractlet 5-nerved, minutely awned, with an oblique callus and a short tuft of silky hairs at base; awn minute, sub-terminal; palea 2-keeled, sulcate between the keels, 2-toothed. Scales very acuminate. Stamens 3. Ovary glabrous; styles short, distinct. (Greek ammos, sand, and philia, affection, from its preference for sand-dunes.)

1. *A. arenaria* (L.) Link. BEACH-GRASS. Rootstock widely creeping; stems 2 to 4 ft. high; sheaths long; ligule very long, 2-fid, torn; blades convolute and polished without, scabrid and glaucous within; panicle spike-like, sub-cylindric-fusiform, 3 to 6 in. long, straight, broadest and sometimes lobed at the base, white or yellowish; pedicels scabrous; spikelets erect, 5 to 6 lines long; bracts ½ to ½ in. long; keel scabrid; hairs and prolongation of the rachilla less than ½ as long as the spikelet; anthers ¼ in. long, linear, yellow.—(*A. arundinacea* Host.)

Introduced from Europe into California about 1876, by Mr. Louis McLane, at the instigation of Prof. Geo. Davidson, for binding the drifting coast-sands of Golden Gate Park. Now thoroughly established at Golden Gate Park, Point Lobos and South Beach, as well as at Point Reyes and Point Arena. July.

TRIBE 5. Aveneæ. OATS TRIBE.

Inflorescence in lax, rarely contracted panicles, or in *Danthonia* sometimes reduced to a raceme of 1 to 10 terminal spikelets. Spikelets all alike, usually with 2 or more perfect flowers (1 perfect and 1 staminate in *Holcus* and *Arrhenatherum*; rarely 1-flowered by abortion in *Deschampsia* and *Trisetum*), the imperfect flowers when present, uppermost (except in *Arrhenatherum*). Bracts large in proportion to the whole spikelet, usually exceeding the uppermost bractlet. Rachilla, except in *Holcus*, jointed above the bracts so that these persist after the flower has fallen, prolonged beyond the insertion of the uppermost flower except in *Aira*. Bractlet usually awned on the back, rarely from between the teeth of the 2-fid apex; awn usually geniculate or twisted.

A. Bracts readily deciduous with the flower.

Spikelet strictly 2-flowered; lower flower perfect, its bractlet awnless; upper flower staminate (or rarely perfect), its bractlet with a short awn. 16. *HOLCUS*.

B. Bracts persistent after the flower has fallen.

Rachilla not prolonged beyond the insertion of the upper flower; spikelets strictly 2-flowered.

Bractlets hyaline, 2-toothed, dorsally awned; flowers closely superposed. 17. *AIRA*.

Rachilla prolonged beyond the insertion of the upper flower; spikelets (in ours) 2 (rarely by abortion only 1 in *Deschampsia* and *Trisetum*) to many-flowered. Awn of the bractlet arising from below the teeth of the apex, not from between them.

Lower flower always perfect; the uppermost sometimes staminate or reduced to its bractlet.

Spikelets less than 5 lines long (excluding the awn); achene free from the bractlet and palea, unfurrowed.

Bractlet finely erose-dentate, or 2-lobed, or truncate and entire; spikelets strictly 2-flowered 18. *DESCHAMPSIA*.

Bractlet cleft or 2-toothed, with the teeth sometimes produced into awns; lowest flower awned; spikelets 2 to 6-flowered, often shining. 19. *TRISETUM*.

Spikelets more than 5 lines long (excluding the awn); achene usually adnate to its bractlet and palea, furrowed. 20. *AVENA*.

Lower flower staminate, strongly awned from near the base; the upper perfect, awnless or short-awned at the apex. 21. *ARRHENATHERUM*.

Awn of the bractlet arising from between its lobes or teeth; the teeth in many cases prolonged into straight awns 22. *DANTHONIA*.

16. *HOLCUS* L. VELVET-GRASS.

Leaf-blades flat. Spikelets much laterally compressed, 2-flowered; pedicels jointed below the bracts, so that these are readily deciduous with the flower. Bracts 2, boat-shaped, keeled; lower 1-nerved; upper larger, 3-nerved, notched, acute or sometimes shortly awned. Rachilla shortly prolonged beyond the insertion of the uppermost flower-

enclosing bractlet, sometimes terminated by a minute rudimentary bractlet. Lower flower perfect; upper staminate. Bractlets shorter than the bracts, 3-nerved; that of the lower flower awnless, of the upper with a short, dorsal, somewhat twisted awn. Palea 2-nerved, truncate, 3-toothed. Scales oblique, acuminate. Stamens 3. Ovary glabrous; stigmas sessile. (Holkos, a classic Greek name for some grass, perhaps derived from holkos, attractive.)

1. **H. lanatus** L. MESQUIT-GRASS. Perennial; rootstock creeping, fibrous; stems tufted, ascending, 1 to 2 ft. high, slender, leafy; sheaths densely soft-pubescent, the uppermost inflated; ligule short; blades soft; panicle pyramidal 2 to 5 in. long, pale green or pinkish; branches 2 to 3-nate; spikelets about 2 lines long, elliptic-oblong, the awn erect before anthesis then incurved and scarcely or not at all protruded; bracts acute, ciliate on the keels, nerves prominent; anthers rich purplish-brown.

A conspicuous, softly-woolly, pale-colored grass of moist bottom lands. Naturalized from Europe. San Francisco, *Bolander*; Cobb Mt., *Leithold*; Olema; Point Reyes; Guerneville. The closely related species *H. mollis* should be looked for. It resembles *H. lanatus*, of which it is considered by some only a variety, but differs in its more slender habit, in being almost glabrous except at the nodes which are conspicuously downy; the bracts are more scabrid and very acuminate, and the awn of the upper bractlet is considerably protruded beyond them.

17. **AIRA** L. HAIR-GRASS.

Slender, dwarf annuals. Leaf-blades setaceous. Panicle-branches capillary, sub-erect. Spikelets less than 2 lines long, in ours strictly 2-flowered; bracts thinly scarious; rachilla not prolonged beyond the insertion of the upper bractlet. Bractlets thin, scarious, not projecting beyond the bracts; awn dorsal, short, hair-like. Near to *Avena* in technical characters, but spikelets much smaller. (Greek *aira*, the name of a weed in wheat-fields, probably *Lolium temulentum*; derived from Greek *airein*, to hurt, on account of its poisonous qualities, *Syme*.)

Panicle-branches much divided and bearing tufts of spikelets at the ends; bractlet of each flower awned. 1. *A. caryophyllea*.
Panicle more open; spikelets less numerous and not tufted, smaller; bractlet of the lower flower awnless, of the upper awned. 2. *A. capillaris*.

1. **A. caryophyllea** L. SILVERY HAIR-GRASS. Slender, graceful, tufted grass, 8 to 10 in. high; sheaths scabrid, often pinkish at the base; blades short, fine, ephemeral; panicle loose; branches long, much divided, and bearing usually dense tufts of spikelets at the ends; pedicels short, scabrid; spikelets $1\frac{1}{4}$ lines long; bracts widely gaping at the apex, shining above, thinly scarious, the flowers plainly discernible through them; bractlet brownish, long-acuminate, 2-fid; that of each flower awned; awns protruding $\frac{1}{2}$ line or more.

Naturalized from Europe, now common on old cattle ranges in the Bay Region: Lake Pilarcitos, Mt. Tamalpais, Olema, Point Reyes and in Mendocino Co. May-Aug.

2. *A. capillaris* Host. FINE HAIR-GRASS. Resembling *A. caryophyllæa* but the panicle much more open; spikelets less numerous and not tufted, only 1 line long; pedicels longer and sometimes glabrous; bractlet of the lower flower awnless, of the upper awned; awns hygroscopic.

Naturalized from southern Europe: Tocaloma, 1893, *Michener* and *Bioletti*; Humboldt Co., *Dary* and probably occurring elsewhere but perhaps confused with the preceding. May.

18. *DESCHAMPSIA* Beauv.

Panicle mostly open (rarely contracted), branches slender. Spikelets small, 2-flowered; flowers both perfect, somewhat distant, lower sub-sessile, upper pedicellate; rachilla jointed, hairy, prolonged beyond the insertion of the upper flower-enclosing bractlet as a hairy bristle which is sometimes terminated by an empty bractlet. Bracts equaling or exceeding the uppermost flower-enclosing bractlet, thin membranaceous, 1 to 3-nerved, keeled, acute; margins and apex thinly scarious. Bractlet membranaceous or nearly hyaline, 2-toothed or cleft, or truncate and denticulate, with a fine dorsal awn below the middle; palea narrow, prominently 2-nerved, often 2-toothed. Stamens 3. (Dr. Deschamps, a French physician and naturalist of St. Omer, naturalist to the La Perouse relief expedition. Grasses with the shining spikelets of *Trisetum* and *Aira*, usually smaller than in the former, larger than in the latter with which genus they were formerly united; stems usually stouter than in *Aira*.)

Stems stout, from a tufted rootstock; bracts barely equaling, and mostly shorter than the whole spikelet; the lower 1-nerved; panicle contracted, erect or somewhat drooping, dense and somewhat spikelike; branches short, stoutish; awn stout, straight. 1. *D. holciformis*.

Stems slender, weak; bracts exceeding the uppermost bractlet.

Perennial.

Panicle-branches several at a node, very unequal in length, mostly appressed, bearing many spikelets; spikelets $1\frac{1}{2}$ to 2 lines long; bractlet obscurely nerved or nerveless; achene grooved. 2. *D. elongata*.

Panicle racemose, 1 to 2 in. long; branches appressed, with few spikelets.

Diminutive plant, 3 to 4 in. high. 2. *D. elongata*

var. *tenuis*.

Annual; panicle-branches mostly in 3's below, in pairs or solitary above, distant, mostly spreading and bearing few (about 5) spikelets at the ends; spikelets $2\frac{1}{2}$ to 4½ lines long; bractlet 5-nerved. 3. *D. calycina*.

1. *D. holciformis* Presl. CALIFORNIA HAIR-GRASS. Perennial; rootstock forming large, dense tufts; stems 2 to 5 ft. high, stout, arising from a dense tuft of involute leaves; ligule 1 to 2 lines long; panicle contracted, dense, erect or somewhat drooping, 6 to 10 in. long; branches many at a node, sub-erect, the longest $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, branched and spikelet-bearing almost to the base; spikelets $2\frac{1}{2}$ to 3 lines long, short-pedicel, usually purplish-tinted below, yellowish to brown above; bracts barely equaling; and mostly shorter than the whole spikelet, acute; bractlet membranaceous, silky-hairy at base, rather regularly 4-toothed; awn stout, about $1\frac{1}{2}$ lines long, inserted near the base of the bractlet, usually shortly exserted; anthers 1 line long, purplish.—(*Aira holciformis* Steud.)

Wet meadows and borders of streams: moist meadows Mission Dolores, San Francisco, and Oakland Hills, *Bolander* in 1862; Presidio; Mark West's Creek; Point Reyes. Apr.—July.

2. *D. elongata* (Hook.) Munro. SLENDER HAIR-GRASS. Perennial; stems very slender and weak, 8 to 24 in. high or more, from a dense tuft of bright green, fine, smooth, short, very narrow leaves; ligule acute, 2 lines long; panicle very long and narrow; branches several at a node, distant, mostly appressed, capillary, scabrous, spikelet-bearing above the middle; pedicels somewhat clavate; spikelets many, $1\frac{1}{2}$ to 2 lines long; bracts linear-subulate, acuminate, nearly equal, 3-nerved, green, exceeding the uppermost bractlet; bractlet 1 line long, smooth and shining, with a tuft of silky hairs at base, irregularly 5-toothed or lacerate at apex; the lower and its flower on a short callus; the upper upon a very hairy internode $\frac{2}{3}$ as long as the lower; awn arising from near the base of the bractlet and twice its length, very slender and long exserted.—(*Aira elongata* Hook.)

Moist places along the coast northward to Oregon.

Var. *ciliata* Vasey. Stems 2 to $2\frac{3}{4}$ ft. high; ligule 4 lines long; blades involute and softer; panicle often 12 in. long; awns longer than in the type.—Lake Pilarcitos; Olema. June—Aug.

Var. *tenuis* Vasey. Very small plant, 3 to 4 in. high, with soft, hair-like, bright-green foliage; ligule long, white; panicle racemose, 1 to 2 in. long; branches appressed, with few spikelets.—Shady places beside an intermittent foothill streamlet, Evergreen, Santa Clara Co. May.

3. *D. calycina* Presl. TICKLE-GRASS. Annual; stems slender, from a few inches to 2 ft. high, simple, often growing in dense masses, rarely geniculate and sparingly branched below; leaves few, short, narrow and ephemeral; ligule 1 to $1\frac{1}{2}$ lines long, acuminate; panicle simple, very loose and open or narrow, about $\frac{1}{3}$ the length of the stem; branches mostly in 3's below, in pairs or solitary above, bearing few (about 5) spikelets upon the upper part, naked below; spikelets $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long; lower flower on a short callus, its bractlet overlapping that of the upper flower; bractlet about 1 line long, hairy below, shining above, 5-nerved; apex emarginate, with 4 minutely ciliate teeth; awn inserted below the middle, about 3 times as long as the bractlet, light brown, twisted below and bent near the middle.—(*Aira danthonioides* of Bot. Calif.)

Common in the San Francisco Bay region and elsewhere in the State, on poor, clayey soils: Napa Valley near St. Helena; Montezuma Hills, Solano Co., *Jepson*; Kenwood; Santa Cruz. Apr.—June.

19. *TRisetum* Pers. OAT-GRASS.

Leaf-blades flat. Panicle usually open, narrow, more or less drooping above; branches in whorls, slender, erect, spreading or drooping. Spikelets 2 to 5-flowered. Bracts mostly shorter than the whole spikelet, unequal, keeled, membranaceous; margins scarious; lower bract 1 to 3, upper 3-nerved; rachilla extending beyond the insertion

of the uppermost flower-enclosing bractlet, and terminated by an empty bractlet or a slender awn. Flower-enclosing bractlets like the bracts in texture, keeled, 5-nerved, acuminate, ending in two long, subulate teeth, with a long, bent and twisted awn arising from between them; palea 2-nerved and 2-toothed. Ovary hairy or smooth; stigmas almost sessile. Achene smooth, not furrowed. (Latin tres, treis or tris, three, and saeta, a bristle, referring to the awn-like points which terminate the bractlet in many species.)

Panicle lax; branches more or less spreading or sub-erect.

Spikelets large, 6 to 12 lines long, 2 to 3 lines wide, 3 to 8-flowered, resembling those of a *Bromus*; rachilla nearly glabrous, bractlets hirsute.

1. *T. barbatum*.

Spikelets small, 3 to 6 lines long, about 1 line wide, 2 to 3 (rarely 4)-flowered; rachilla clothed with long hairs, bractlets sub-glabrous; lower bract less than $\frac{1}{2}$ as long as the upper; panicle-branches spikelet-bearing on the upper half.

2. *T. cernuum*.

Panicle contracted, strict; branches short, erect, the whorls not widely separated.

Spikelets small, about 4 lines long; lower bract only about $\frac{1}{4}$ shorter than the upper; bractlets imbricate, minutely puberulent; panicle-branches mostly spikelet-bearing to the base.

3. *T. canescens*.

1. *T. barbatum* Steud. BROME-LIKE OAT-GRASS. Annual; stem usually solitary, 2 to 3 ft. high; sheaths hirsute with spreading hairs arising from minute tuberculations, glabrescent in age; blades 6 in. long, 2 to 3 lines wide, pilose-ciliate when young, sub-glabrous with age; panicle lax, 4 to 9 in. long; branches slender, sub-erect, lower bearing 2 to 4, upper only 1 spikelet; spikelets 6 to 12 lines long, 2 to 3 lines wide, 5 to 8-flowered, much flattened, resembling those of a *Bromus*; bracts narrow, acuminate, scabrous on the keel, 3-nerved, nearly reaching to the apex of the nearest bractlet; internodes of the rachilla short, nearly smooth; bractlet 5 to 6 lines long, hirsute all over; teeth subulate; awn stout, twisted below, then bent outwards, 6 to 8 lines long.—(*Bromus barbatoides*, Beal.)

Near thickets on hillsides, San Francisco, *Bolander*; also reported from Oakland. Mar.—June.

2. *T. cernuum* Trin. NODDING OAT-GRASS. Perennial; stems 2 to 3 ft. high, slender, in tufts; leaf-blades 6 to 9 in. long, $3\frac{1}{2}$ to 6 lines wide, sub-glabrous or sparsely pilose on the nerves, not ciliate; panicle 6 to 10 in. long, very open, drooping above; branches in remote whorls, drooping, long, capillary, roughened, bearing 2 to 3 or rarely 4 spikelets above the middle; spikelets 3 to 6 lines long, 1 line wide; bracts very unequal, the lower narrow, subulate; upper more than $\frac{1}{2}$ longer, broad, 3-nerved, obtuse and mucronate; rachilla clothed with long, silky hairs, internodes 1 to $1\frac{1}{2}$ lines long, the lowest shorter than the others, the terminal bearing an empty bractlet or a long, slender awn; bractlet 2 to 3 lines long, glabrous or slightly scabrous; teeth long and subulate; awn slender, about twice the length of its bractlet.

Description drawn from Mendocino Co. specimens; reported from San Francisco. Mar.—June.

3. *T. canescens* Buckl. SILVERY OAT-GRASS. Perennial; stems 1 to 4 ft. high, stout, erect; sheaths varying from glabrous to pubes-

cent; panicle 5 to 12 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide, pubescent, strict, narrow, more or less densely-flowered, often purple-tinged; branches erect, somewhat crowded, all but the longest bearing spikelets to the base, longest $2\frac{1}{2}$ in. long; spikelets about 4 lines long, narrow, 2 to 3-flowered; lower bract narrow, acute, about $\frac{1}{4}$ shorter than the broad upper one; bractlets not spreading nor very remote, imbricate, 3 to 4 lines long, narrow, minutely puberulent, long subulate-pointed; awn stout, about twice the length of its bractlet.

Dry, open ground or open woods and thickets; Coast Ranges northward to Oregon and in the Sierra Nevada: Berkeley hills; Mt. Tamalpais; Olema. Apr.-Sept.

20. AVENA L. OATS.

Ours annual. Stems sub-solitary. Leaf-blades flat. Panicle lax; the branches unequal, and bearing few, pendulous spikelets on slender, geniculate, abruptly clavate pedicels. Spikelets 2 to many (rarely only 1)-flowered, the uppermost flowers staminate or abortive. Bracts 2, persistent, unequally nerved. Rachilla jointed above the bracts between the perfect flowers. Bractlet rounded on the back, the apex (in ours) shortly 2-fid, the back bearing a stout awn, mostly geniculate and twisted below; palea narrow, 2-dentate or 2-fid, 2-keeled. Scales 2-fid. Stamens 3; anthers sub-basifixed. Ovary and achene hairy, at least at the top; styles short, distant. (*Avena* the old Latin name for Oats.)

Awn short or often obsolete, not geniculate; bractlet 7-nerved, glabrous or with a few long hairs at the base. 2. *A. sativa*.

Awn 10 to 24 lines long, geniculate.

Bractlet acute but not awn-pointed, 9-nerved, the 2 marginal nerves fine, sometimes not continued to the apex. 1. *A. fatua*.

Bractlet acuminate, awn-pointed, 7-nerved. 3. *A. barbata*.

1. **A. fatua** L. WILD OATS. Stems stoutish, 2 to $3\frac{1}{2}$ ft. high; ligule short, lacerate; blades long and broad, scabrid; panicle 6 to 14 in. long; branches few at a node, very unequal, long and filiform; spikelets drooping, 2 to 3 (rarely only 1)-flowered, broad; bracts subequal, ovate-lanceolate, acute, 10 to 12 lines long excluding the awn, 9 to 11-nerved; bractlet less than 10 lines long, acute, 2-fid, $3\frac{1}{2}$ lines wide, firm, thinly hairy with usually yellowish hairs, especially below, brown, 9-nerved; that of the uppermost flower sub-glabrous; awn from near the middle of the bractlet, stout, 10 to 20 lines long, geniculate; palea about 7 lines long, and $1\frac{1}{2}$ wide, with short divergent hairs on the nerves.

Not uncommon in the Bay Region: San Jose; Mt. Hamilton; Danville and Livermore. May-Aug.

Var. **glabrescens** COSS. BASTARD OATS, is distinguished by having the bractlet naked except for a few short hairs at the base, and sometimes a thin pubescence along the margins, in which it approaches *A. sativa*; from the latter it may always be distinguished by the longer and geniculate awn and the wider 9-nerved bractlet. Introduced at San Bernardino and San Jose acc. to Dewey; Berkeley, *Davy*.

2. *A. sativa* L. COMMON OATS. Near to *A. fatua*, but distinguished by its usually shorter stature, by the 7-nerved bractlet being glabrous (or bearing a few long hairs at the base), and by the often short, straight awn which is sometimes obsolete.

Frequently found as an escape in the borders of fields and by the roadside: Berkeley; Briones Hills.

3. *A. barbata* Brot. BARBED OATS. Stems slender, erect, 2 to 3½ ft. high; uppermost ligule 1 to 1½ lines long, broad, obtuse, truncate, irregularly notched; blades 1 to 3½ lines broad, scabrous on both surfaces; panicle usually 6 to 12 in. long, shorter in dry localities and seasons; branches few at a node, very unequal, long and filiform; spikelets 2 to several-flowered, narrow and slender; bracts subequal, oval-lanceolate, setaceous-pointed, 10 to 12 lines long, with 7, 9 or 11 broadly green-margined nerves; margins scarious, shining; bractlet 10 to 12 lines long, including the long, slender, awn-pointed teeth, 2½ lines wide, lanceolate, membranaceous, clothed with soft, silky, usually white hairs, 7-nerved; awn from near the middle of the bractlet, stout, geniculate, 11 to 20 lines long; palea 6½ lines long, 1 line wide, with short, divergent hairs on the nerves; anthers 1½ lines long; ovary densely hairy with long, white, silky, erect hairs.

A montane species, native of S. Europe and naturalized extensively in California in the Coast Range hills, and Southern California: San Jose, *Brainard*, Lake Merced, Olema, Angel Island, Point Isabel, Livermore, Berkeley. Mar.-Aug. Often mistaken for *A. fatua*, from which it may be distinguished without difficulty, when once known, by its more slender inflorescence and spikelets.

21. *ARRHENATHERUM* Beauv.

Perennial, usually tall grasses. Leaf-blades flat. Spikelets terete, strictly 2-flowered; rachilla jointed between the flowers, often hairy, prolonged beyond the insertion of the uppermost bractlet as a short point or bristle; lower flower staminate, upper pistillate or perfect. Bracts persistent, scarious (in ours), very unequal, shortly acuminate, keeled. Bractlets rigid, 5 to 7-nerved, 2-toothed, that of the lower flower with a long, basal, bent and twisted awn, that of the upper with a short, dorsal awn; palea 2-nerved. Scales lanceolate, laterally toothed. Stamens 3. (Greek *arrhen*, masculine, ather, awn; only the male flower is conspicuously awned.)

1. *A. elatius* (L.) Beauv. TALL OAT-GRASS. Rootstock perennial, widely creeping; stems 2 to 4 ft. high, erect, slender, smooth, leafy, often densely tufted; lowest internode sometimes developed into a corm; leaves bright green; sheaths smooth; ligule broad, obtuse, about 1 line long; blades soft, minutely scabrid, 2½ to 3½ lines wide; panicle narrow, pale green, shining, 6 to 8 in. long, drooping; branches short, erect, scabrid, spreading in flower, densely whorled, bearing few spikelets; spikelets 3 to 4 lines long; upper bract enclosing the 2 flowers, acute; lower much smaller; bractlet hairy below, about half as long as the twisted, bent awn.—(*A. avenaceum* Beauv.; *Avena elatior* L.)

Sparingly naturalized in California: reported from the vicinity of San Francisco, *Behr*; Berkeley hills, *Davy*. June-Sept.

22. **DANTHONIA** DC.

Inflorescence in ours consisting of a paniculate raceme or simple panicle or the spikelets solitary and terminal. Spikelets about 7-flowered. Bracts persistent, nearly equal, keeled, awnless, equaling the whole spikelet, 3 to 9 (rarely only 1)-nerved. Rachilla jointed and pilose between the flowers, prolonged beyond the insertion of the uppermost bractlet. Flowers all perfect, or the uppermost staminate. Bractlet 7 to 13-nerved, terminating in 2 sharp, usually rigidly awn-pointed teeth, between which is a geniculate, spreading awn, flattened at the base and spirally twisted, formed from the three middle nerves; palea hyaline, broadly 2-nerved, equaling or exceeding the entire portion of the bractlet, obtuse or 2-toothed. Stamens 3. Scales 2, entire. Ovary smooth, stipitate. (Named in honor of Etienne Danthoine, a French botanist of the 18th century.)

1. **D. Californica** Boland. **DANTHONIA**. Tufted perennial; stems $1\frac{1}{2}$ to 3 ft. high, slender, usually sub-erect; sheaths bearded at the throat, densely or sparsely villous, or smooth, the hairs arising from minute, white papillæ; ligule obscure; blades mostly convolute-setaceous; spikelets 1 to 5, rarely 10, terminal, $7\frac{1}{2}$ to 12 lines long, usually purplish; pedicels long, slender, minutely and densely hirsute, spreading; bracts enclosing the rest of the spikelet, acuminate, 8 to 10 lines long; flowers about 7; bractlet broad, coriaceous below, about 4 lines long excluding the awn, with tufts of white hairs on the callus and on the margins from about the middle downwards; its teeth about 2 lines long; awn spreading, barely exerted, brownish below, with short, spreading hairs on the nerves; palea ciliate, notched above; achene about 2 lines long.

Coast Ranges from San Francisco Bay northward and southward; the prevalent grass on dry hills, especially along the coast: Berkeley; San Francisco; Crystal Springs Lake; Olema; Point Reyes. Type locality "on borders of cultivated fields near the bay at Oakland; hills near Mission Dolores, San Francisco."

TRIBE 6. **Chlorideæ**. FINGER-GRASS TRIBE.

Inflorescence a simple panicle of spikes which are usually digitate at the end of, or scattered along, its main axis, or, rarely, solitary and terminal. Rachis not jointed or notched as in *Hordeæ*. Spikelets sessile in 2 rows, which form unilateral spikes; in ours all perfect and 1 or rarely 2-flowered; lowest flower always perfect. Rachilla usually prolonged beyond the insertion of the terminal flower, and (except in *Spartina*) jointed above the bracts so that these persist after the flowers have fallen. Bractlet usually keeled, entire and unawned, or toothed and with 1 or 3 terminal straight awns. The inflorescence closely resembles that of *Paspalum*, but the spikelets resemble those of *Festuceæ*.

Spikes digitate; prostrate, running grass, rooting at the nodes 23. **CYNODON**.
 Spikes scattered along the main axis of the panicle; erect plants.

Bracts very unequal; long, narrow, acuminate; tidal creeks and marshes . . .
 24. **SPARTINA**.

Bracts equal, short, broad and boat-shaped, abruptly acute; sloughs and
 banks of rivers and streams 25. **BECKMANNIA**.

23. **CYNODON** Rich. DOG'S-TOOTH-GRASS.

Perennial. Leaf-blades narrow, usually flat, often short. Panicle branches 2 to 6, digitate at the apex of the peduncle, erect or radially spreading. Spikelets alternate, sessile (in ours) on one side of the rachis, 1-flowered. Bracts 2, persistent, often narrow, keeled; rachilla jointed above the bracts and often prolonged beyond the base of the bractlet as a bristle. Bractlet boat-shaped, distinctly keeled; palea often shorter and narrower, hyaline, 2-nerved. Stamens 3. Achene glabrous, not channeled. (Greek *kuon*, a dog, odous, a tooth.)

1. **C. Dactylon** (L.) Pers. **BERMUDA-GRASS**. Stems prostrate, creeping, often several feet in length, clothed with undeveloped sheaths, producing roots and tufts of leaves at the nodes and often one or more prostrate, barren branches; flowering stems 4 to 24 in. high, leafy; sheaths much crowded, loose, strongly striate; ligule short, ciliate with long hairs; blades about an inch long and a line wide, stiff and sometimes involute, glaucous; panicle-branches 3 to 6, 1 or 2 in. long, concavo-convex; spikelets about 1 line long, appressed, closely imbricate; bracts shorter than the bractlet, ovate-lanceolate, nearly equal, usually spreading, rough on the keel or not; bractlet smooth, keel and margins ciliate; palea narrow.—(*Capriola Dactylon* Ktze.)

Tropical species naturalized in California and frequently occurring as a roadside weed on the outskirts of towns, especially in the warm interior valleys; in the Coast Ranges at San Rafael, Pacheco, Berkeley and Alameda; Bolander records having seen it in the vicinity of San Francisco in 1862. Apr.—Oct.

24. **SPARTINA** Schreb. CORD-GRASS.

Mostly maritime perennials. Stems simple, erect, reed-like but short. Leaf-blades long, tough. Panicle narrow, erect, dense, composed of several erect, approximate spikes; spikelets large, compressed, more or less imbricate, in rows on two sides of the triangular panicle-branches, 1-flowered. Bracts unequal, keeled, acute, or bristle-pointed, about as long as the whole spikelet; rachilla sometimes prolonged beyond the insertion of the flower. Bractlet sub-hyaline, faintly 2-nerved; palea equaling it or longer. Scales short, obtuse. Stamens 3. Style-branches long, slender. (Greek *spartine*, a rope or cord made of *spartos*, *Spartium junceum* and *Stipa tenacissima*.)

1. **S. stricta** var. **glabra** Muhl. **CORD-GRASS**. Rootstock creeping, scaly; stems very stout, $1\frac{1}{2}$ to 4 ft. high; leaf-blades long, flat, smooth, tapering from about 3 lines wide near the middle to long, slender points; panicle 6 to 9 in. long; branches 2 to 3 in. long;

spikelets $\frac{1}{2}$ in. long; bracts varying from glabrous to strongly ciliate on the keels; anthers yellow, 2 lines long.

Common along the borders of salt-marshes around San Francisco and San Pablo Bays, usually, if not always, within reach of tidal water: near Sausalito; San Rafael; Alameda; West Berkeley; etc. Aug.-Dec.

25. BECKMANNIA Host.

Leaf-blades flat. Panicle long, narrow, erect, dense, composed of several approximate, erect, racemed spikes. Spikelets crowded in 2 rows, on the 2 lower sides of the sub-triangular panicle-branches, imbricate, compressed, 2 (or by abortion) 1-flowered, 1 to $1\frac{1}{2}$ lines long. Bracts broadly inflated and somewhat boat-shaped, laterally compressed, sub-equal, obtuse or abruptly pointed; margins scarious. Bractlet narrow, concave-keeled, membranaceous, 5-nerved; palea hyaline, 2-keeled, nearly as long as the bractlet. Stamens 3. (In honor of J. Beckmann, 1739-1811, the author of a "Lexicon Botanicum.")

1. *B. erucæformis* (L.) Host. SLOUGH-GRASS. Stems 2 to 3 ft. high, stoutish, strict, solitary or somewhat tufted, erect from a slightly decumbent base, leafy; sheaths slightly rough; ligule elongated; blades 4 to 8 in. long, 3 to 4 lines wide, roughish; panicle 8 to 12 in. long; branches solitary or in twos or threes, sometimes again shortly branched, densely clothed with spikelets in 2 rows; spikelets about $1\frac{1}{2}$ lines long, nearly orbicular or broadly obovate; bracts with 3 principal nerves, and some transverse ones, dark green on the keel, paler and somewhat wrinkled transversely; bractlet pointed, the point often exserted.

Somewhat resembling a *Panicum*. Sloughs, borders of streams and wet bottom lands in mountain regions from Santa Clara Co. northward: between Bolinas and Olema; Kenwood; Conn Valley; near Willits. Apr.-July.

TRIBE 7. Festuceæ. FESCUE TRIBE.

Inflorescence paniculate or racemose, the racemes sometimes almost spicate on account of the very short pedicels of the spikelets. Spikelets 2 to many-flowered (rarely 1-flowered in *Melica*, *Koeleria*, *Festuca* and *Lamarckia*); flowers perfect or the uppermost imperfect (the lowest imperfect in *Phragmites*); in *Lamarckia* one spikelet at each node is perfect, the others being sterile; in *Distichlis*, some species of *Poa* and sometimes in *Phragmites* the flowers are diœcious or polygamo-diœcious. Bracts rarely reaching the apex of the nearest bractlet. Bractlet in ours entire or 2-toothed or 2-cleft, awnless or with 1 (in ours never 2 to 5) awns; awn straight, terminal at the apex or from between the teeth, never dorsal nor bent and twisted as in *Aveneæ* and *Agrostideæ*. Palea 2-keeled.

A. Rachilla or bractlet, at least that of the perfect flower, clothed with long, erect hairs which envelop the latter; bractlet (in ours) thin-membranaceous or hyaline, 3-nerved; tall, reed-like grasses.

- Bractlet hairy; rachilla naked 26. *ARUNDO*.
 Bractlet naked; rachilla hairy 27. *PHRAGMITES*.
 B. Rachilla and bractlet naked, or if hairy the hairs much shorter than the bracts and bractlet; stigmas (in ours) plumose, comparatively short, either sessile or raised on a short style, protruding from the sides of the bractlet.
 Spikelets of two kinds at each node, very dissimilar in form, one perfect and 1 to 3-flowered; the others sterile and composed of many empty bractlets.
 Perfect spikelets 1-flowered, the sterile consisting of about 10 empty bractlets which are obtuse 35. *LAMARCKIA*.
 Spikelets alike in form though sometimes dioecious.
 Flowers dioecious; rootstock perennial.
 Spikelets 8 to 16-flowered; rootstock very stout and creeping, scaly; panicle dense, ovoid; grasses of salt-marshes or alkali soils . . 32. *DISTICHLIS*.
 Spikelets 2 to 6-flowered; rootstock tufted or if creeping then long and slender 36. *POA*.
 Flowers all perfect, or perfect and imperfect in the same spikelet.
 Bracts and bractlets awnless.
 Bractlet 1 to 3-nerved.
 Annuals; panicle more or less lax; spikelets many (sometimes 70)-flowered, the flowers densely imbricate; palea persistent after the bractlet and achene have fallen 28. *ERAGROSTIS*.
 Perennials; panicle contracted and spikelike, dense or slightly interrupted, silvery shining; spikelets 2 to 7 (rarely only 1)-flowered. 29. *KÆLERIA*.
 Bractlet 3 to 5-nerved.
 Perennials; uppermost flower-enclosing bractlet enwrapping 1 to 3 smaller empty bractlets, which in ours are truncate-clavate . . . 30. *MELICA*.
 Bractlet 5 to many-nerved.
 Spikelets large, flattened, ovate, somewhat cordate at base; bractlet very obtuse, concave, becoming ventricose; annuals . . 33. *BRIZA*.
 Spikelets not cordate, mostly smaller.
 Bractlet laterally compressed, mostly keeled, the margins or nerves below clothed with cobwebby hairs, or pubescent, its lateral nerves arched, converging above toward the mid-nerve. 36. *POA*.
 Bractlet rounded on the back, at least below, naked at the base, its lateral nerves nearly parallel, scarcely or not at all converging. 37. *PANICULARIA*.
 Either bracts or bractlets awned, awn-pointed or mucronate (in *Kæleria*).
 Palea with conspicuously toothed marginal wings on the keels; bractlet with a straight, rigid awn; annuals of wet meadows, with weak stems, and pale greenish-yellow foliage 31. *PLEUROPOGON*.
 Palea without marginal wings on the keel.
 Panicle contracted and spikelike, dense or slightly interrupted, silvery-shining 29. *KÆLERIA*.
 Panicle 1-sided, glomerate or interrupted; spikelets in dense, 1-sided fascicles 34. *DACTYLIS*.
 Panicle more or less lax; not dense and spikelike.
 Stigmas plainly arising at or near the apex of the ovary; ovary and achene in most cases smooth; bractlet not notched or 2-lobed, usually awned or awn-pointed 38. *FESTUCA*.
 Stigmas plainly arising below the apex of the ovary, on the anterior portion; ovary and achene crowned by a little appendage or tuft of short hairs; achene always adnate to the palea; bractlet usually distinctly notched or shortly 2-lobed at the apex, with an awn between the notches 39. *BROMUS*.

26. *ARUNDO* L.

Perennial reeds; stems tall, stout, erect. Leaf-blades broad, flat. Spikelets 2 to 6-flowered, in a dense and somewhat spreading panicle. Bracts somewhat unequal, keeled, 3-nerved. Rachilla naked, jointed above the bracts and between the flowers. Flowers crowded, all perfect or the upper staminate. Bractlet slender, 2-toothed and with

an awn or cuspidate point between the teeth, clothed with long, silky hairs. Palea shorter, hyaline, pubescent on the keels. Stamens 3. Ovary naked. (Latin *arundo*, a reed or cane.)

1. **A. Donax** L. GIANT REED. Rootstock very stout, creeping, tufted; roots stout, fibrous; stems in dense clumps, 10 to 20 ft. high, mostly with short, slender branches from the upper nodes, leafy throughout; leaves pale green; sheath striate, bearded and somewhat auricled at the throat; ligule about 1 line long, barely exserted, truncate, entire, uniform in width all around; blade striate, mostly 2 to 3 in. wide, the uppermost $1\frac{1}{2}$ to 2 ft. long; spikelets 5 to 7 lines long, 2 to 3-flowered; bracts equaling the whole spikelet, lanceolate-acuminate, entire, awnless, glabrous; bractlet acuminate; awn often twice the length of the teeth.

Introduced as an ornamental cultural plant and occasionally met with as an escape from gardens. It is not known to flower with us. Alameda Marshes, 1898, *Davy*.

27. PHRAGMITES Trin.

Perennial water-reed. Stems tall, stout. Leaf-blades flat. Panicle large, much branched, feathery. Spikelets sub-terete. Bracts short, unequal, membranaceous, keeled. Rachilla terminating in a rudimentary bractlet or point, elongated and jointed between the flowers, the joints clothed, except below the lowest flower, with long, silky hairs which surround the bractlets. Bractlets 3 to 6, very long-acuminate, 3-nerved, entire; the lowest empty or bearing a staminate flower with 1 to 3 stamens, the upper bearing perfect flowers with 3 stamens; palea very much shorter than its bractlet, hyaline, 2-ribbed. Scales large, obtuse. Ovary glabrous. (A Greek name used by Dioscorides for some plant; from *phragmites*, of or for a fence, growing in hedges; perhaps originally applied to *Arundo Donax*, which is still used in Latin and Spanish-American countries for living hedges.)

1. **P. vulgaris** (Lam.) B. S. P. COMMON REED. Rootstock creeping, jointed; stems 5 to 12 ft. high, leafy throughout; sheaths smooth; ligule reduced to a minute ring of hairs; blades smooth-surfaced, rough-margined, 12 to 16 in. long or more, often 1 in. broad, rigid, attenuate-pointed, glaucescent below; panicle 10 to 18 in. long, ovoid, dense, soft, usually dull purple, nodding; branches glabrous; spikelets $\frac{1}{2}$ to $\frac{3}{4}$ in. long; bracts lanceolate, not equaling the nearest bractlet; bractlets very narrow, subulate, the tip of the lowest sometimes twisted.—(*P. communis* Trin.; *P. Phragmites* Karst.)

Borders of rivers, lakes and marshes: tule marshes at Upper Lake; Benicia; Suisun Marshes; Lower Sacramento. Aug.—Oct.

28. ERAGROSTIS Beauv.

Ours low tufted or creeping annuals. Panicle sometimes spike-like and clustered, often loose and spreading. Spikelets much like those of species of *Poa*; usually densely many (sometimes 70)-flowered.

Bracts usually not equaling the nearest bractlet, unequal, keeled; lower 1-nerved, upper 1 to 3-nerved. Rachilla in ours not jointed between the flowers. Flowers all perfect or variously unisexual, or the uppermost (rarely the lowest) reduced to its bractlet and palea. Bractlet membranaceous, awnless, keeled, 3-nerved; lateral nerves sometimes obscure; palea shorter, 2-nerved or 2-keeled, often incurved, frequently persistent after the bracts and bractlet have fallen. Stamens 2 or 3; anther-lobes notched along the edges. Scales 2, sub-cuneate. Styles distinct, elongated. (Greek era, earth, agrostis, a kind of grass, from the low stature of some species.)

1. *E. hypnoides* (Lam.) B. S. P. CREEPING MEADOW-GRASS. Stems slender, creeping, 2 to 12 in. long, branching freely at the nodes; nodes with a ring of short, spreading hairs, leafy; sheaths $\frac{1}{2}$ in. or less long; blades $\frac{1}{2}$ to 2 in. long, $\frac{1}{2}$ to 1 line wide, sparingly hairy; panicle ovoid or densely pyramidal-capitate, $\frac{1}{2}$ to 2 in. long; spikelets very shortly pedicellate, oblong to elliptical or ovate, laterally flattened, 2 to 7 or even 14 lines long, 10 to 40-flowered; bracts less than $\frac{1}{2}$ as long as the nearest bractlet; bractlet lanceolate, acute, compressed-keeled, 5-nerved; keel scabrous-ciliate.—(*E. reptans* Nees.)

Wet places in the San Joaquin and Coast Range Valleys, perhaps not indigenous within our limits: Lathrop; moist sand-banks and beaches along the Russian River above Duncan's Mills. Mar.–Oct.

2. *E. minor* Host. CANDY-GRASS. Stems tufted, 4 to 24 in. high; ligule reduced to a hairy ring; blades 1 to 6 in. long, 1 to 3 lines wide, flat or involute, margins and mid-nerve glandular below; panicle open or rather dense, oblong or ovate, 3 to 5 in. long, olive-green or tinged with lead-color when young, whitish when old; spikelets oblong or lance-oblong, 3 to 10 lines long, 8 to 20-flowered, pedicels glandular; bracts sub-equal, a little shorter than the nearest bractlet, acute, keel glandular; bractlet about 1 line long, oval or elliptical, obtuse or mucronulate, concave, 5-nerved, glandular on the mid-nerve; achene ovoid, light brown, mottled.

Native of S. Europe; reported by Dr. Behr as occurring at San Francisco.

Var. *megastachya* (Gray), (*E. major* Host; *E. poeoides* var. *megastachya* Gray). STINK-GRASS. Differs in having denser panicles and usually larger and more numerous (10 to 50)-flowered spikelets.—Introduced in the San Joaquin Valley at Tulare, and reported also from San Francisco and Monterey.

29. *KÆLERIA* Pers. KÆLER-GRASS.

Panicle contracted, cylindrical, spike-like. Spikelets oblong, compressed, 2 to 5 or 7 (rarely only 1)-flowered. Bracts scarcely equaling the bractlet, unequal, narrow, compressed, acute or produced into short, straight awns or points, keeled, membranaceous and broadly scarious-margined; lower 1, upper 3-nerved with rather faint nerves. Bractlets secund, imbricate, membranaceous, acuminate, obscurely

keeled, 3 to 5-nerved; palea hyaline, 2-fid. Scales 2, oblique. Stamens 3. Ovary glabrous; styles short. Achene almost linear, plano-convex. (Named in honor of Prof. G. L. Kœler, a German Agrostologist, author of "Descriptio Graminum," published in 1802. A genus for which it is hard to assign any absolutely distinctive character. The bracts are more scarious and more faintly nerved than in related genera.)

1. *K. cristata* (L.) Pers. CRESTED KÖELER-GRASS. Tufted pale green pubescent or silky perennial; rootstock stoloniferous; stems 1 to 3 ft. high, slender; sheaths striate; ligule very short; blades narrow, obliquely auriculate at the base; panicle narrow, more or less interrupted or lobed, 1 to 5 in. long; rachis pubescent; branches very short, pubescent; primary ones distichous, usually branched again at the base, spikelet-bearing to the base; spikelets shortly pedicellate, 2 to 3 lines long, shining, pale green; bracts oblong-lanceolate, keel scabrid; bractlet linear-lanceolate, scabrid, mucronate; palea minutely ciliate and scabrid on the keels; anthers 1 line long, pale purple.

Exceedingly variable species, common on dry foothills and sandy tracts: Montezuma Hills, Napa Co.; Vaca Ridge, Solano Co., *Jepson*; San Francisco; Berkeley Hills; Antioch. Apr.-June. Var. *PUBESCENS* Vasey, a very pubescent form, has been collected near San Francisco, *Michener* and *Bioletti*. Var. *LONGIFOLIA* Vasey, a long-leaved form, is reported from Santa Cruz Co. by Dr. Anderson.

30. MELICA L. MELIC-GRASS.

Stems often forming corms at the base by the thickening of 1 or 2 of the lowest internodes. Panicle sparingly branched, often narrow, rarely racemose and secund. Spikelets 2 to 8 (rarely 1)-flowered, terminated by 1 to 3 much smaller, convolute, empty bractlets which enfold one another, the innermost often truncate-clavate. Bracts awnless, unequal, convex, mostly obtuse; upper 5 to 9-nerved, lateral nerves often vanishing in the broad, scarious margin and united by delicate cross-veins. Bractlets somewhat distant, awnless, convex or flattish on the back, 5 to many-nerved; apex scarious, mostly blunt, entire or 2-toothed; central nerves sometimes slightly excurrent; palea 2-nerved, ciliate above, emarginate or 2-toothed. Scales fleshy, mostly united. Styles distinct; stigmas plumose. (An old Greek name for some sweet grass, perhaps Sorghum, from meli, honey, and -ika, a Greek suffix.)

Spikelets of 1 (rarely 2) flowers; bractlet herbaceous-coriaceous, with a narrow scarious margin above, strongly 7 to 9-nerved; stems not corm-like at the base.

Bracts obtuse, shorter than the whole spikelet; bractlet glabrous or scabrid; rudiment shortly pedicellate. 1. *M. imperfecta*.

Upper bract acute, equaling the whole spikelet; bractlet hairy above the middle; rudiment long-pedicellate. 2. *M. Torreyana*.

Spikelets of 2 to 3 perfect flowers; bractlet apparently many-nerved below (at least when dry), with a broad, scarious margin above; lowest internodes swollen and corm-like; ligule brown and pubescent or scabrid below; bractlet 3 to 3½ lines long, obtuse, emarginate. 3. *M. Californica*.

1. *M. imperfecta* Trin. SLENDER MELIC-GRASS. Stems slender,

erect or drooping, 1 to 3 ft. high; lowest internodes not corm-like; leaf-blades 1 line wide; panicle slender, linear, 6 to 12 in. long; branches in distant whorls, several at a node, erect or sometimes in anthesis spreading, very unequal, the longest mostly equaling or exceeding the internodes, spikelet-bearing from about the middle upwards; spikelets $1\frac{1}{2}$ to 2 lines long, 1-flowered with 1 or 2 empty bractlets above it, rarely 2-flowered; bracts nearly ovate, shorter than the nearest bractlet, obtuse, lower 3, upper 5-nerved; margins broadly scarious; bractlet acute; rudiment short-pedicellate.

Commonly met with on shaded hillsides in the Coast Ranges: Mt. Tamalpais; San Francisco; Loma Prieta; Oakland; Berkeley and northward and southward. Apr.

2. M. Torreyana Scribn. TORREY'S MELIC-GRASS. Stems slender, erect or drooping, 1 to 3 ft. high; lowest internodes not corm-like; blades about $1\frac{1}{2}$ lines wide; panicle slender, linear, 3 to 7 in. long; branches few at a node, very unequal, slender, erect, flexuous, often long and naked below, bearing few spikelets near the ends; spikelets 2 to 3 lines long; bracts acute, the upper exceeding or equaling the bractlets; bractlets hairy; rudiment long-pedicellate.

Apparently peculiar to California in the Coast Ranges and Sierra Nevada foothills: Red Ridge, opposite mouth of Conn Valley, Napa River Basin, *Jepson*; Ukiah. Apr.-May.

3. M. Californica Scribn. CALIFORNIA MELIC-GRASS. Stems erect, $1\frac{1}{2}$ to 4 ft. high; lower internodes corm-like; ligule brownish and pubescent or scabrid on the outside below; panicle 6 to 9 in. long, strict; branches few at a node, usually equaling or exceeding the internode, spikelet-bearing to the base; spikelets 4 to 5 lines long, of 2 to 3 perfect flowers; bracts thin, obtuse; bractlet 3 to $3\frac{1}{2}$ lines long, apparently many-nerved below at least when dry, margin above scarious, broad, obtuse, emarginate.—(*M. bulbosa* Thurb. in Bot. Cal., not of Geyer.)

Dry hillsides, often with a western exposure; foothills of the Sierra Nevada and Coast Ranges from Santa Inez northward: Oakland Hills; Berkeley. Apr.-June.

31. PLEUROPOGON R. Br. SIDE-BEARD.

Slender annuals. Leaf-blades flat, together with the sheaths thin and characterized by cross-veins which unite the longitudinal ones and with them form narrow, rectangular spaces. Inflorescence a simple, elongated, second raceme; spikelets distant, shortly pedicellate, long, narrow, 8 to 14-flowered, compressed. Bracts not reaching to the apex of the nearest bractlet, unequal, membranaceous, awnless; lower 1-nerved, upper larger, 3-nerved, the lateral nerves faint. Rachilla jointed between the flowers and breaking up at maturity, undulate, smooth, its internodes less than $\frac{1}{2}$ the length of the bractlets. Bractlet at first herbaceous becoming chartaceo-coriaceous, scarious and prominently 5 to 7-nerved, narrowed below to a rounded, smooth callus, apex 2-toothed or truncate, the mid-nerve prolonged into a mucro or

short, straight, rigid awn; palea 2-nerved and with two winged toothed keels; margins infolded. Stamens 3. Scales short, fleshy, connate. Ovary smooth, ovoid, stipitate. Achene somewhat compressed, strongly furrowed, hard; pericarp loose, 2-horned with the remains of the style-bases. (Greek pleuron, side, pogon, beard, from the arrangement of the awns at the sides of the spikelets.)

1. **P. Californicum** (Nees) Vasey. CALIFORNIA SIDE-BEARD. Stems stoutish but weak, $1\frac{1}{2}$ to 3 ft. long, tufted, simple, smooth; lower nodes rooting; leaves pale yellowish-green; sheaths smooth, striate; ligule prominent, thin, about 3 lines long; lowest blades 6 to 7 in. long, $1\frac{1}{2}$ to 2 lines wide, linear, acute, minutely scabrid above; raceme 6 to 9 in. long; spikelets 6 to 12, sub-erect or spreading, solitary, $\frac{1}{2}$ to 2 in. apart, 1 in. long, yellowish, 11 to 14-flowered; pedicels flattened, 1 to 3 lines long; tips of the bracts and bractlets shining with a silvery luster; bracts 2 to 3 lines long; apex irregularly denticulate; nerves prominent; upper bract the longer; bractlets $2\frac{1}{2}$ to 3 lines long, rough-scabrous, the three central nerves united above to form the awn; awn $1\frac{1}{2}$ to 5 lines long; palea rough on the herbaceous parts; appendages to the keel with 1 prominent stout, acuminate tooth and several irregular smaller ones.—(*Lophochlæna Californica* Nees.)

Apparently restricted to California, in wet meadows and marshy ground, rare: Mt. Eden; Oakland Hills; Walnut Creek; Ross Valley; San Francisco. May–June.

32. **DISTICHLIS** Raf. SALT-GRASS.

Diœcious perennial. Panicle densely spike-like; branches erect, often bearing 2 to 3 spikelets. Spikelets many-flowered, laterally compressed, shortly pedicellate. Bracts narrow, keeled, faintly many-nerved, awnless. Bractlet obscurely many-nerved, awnless; palea with enfolded margins, keeled; keels narrowly winged or prominent, ciliate. Scales broad. Staminate flowers with 3 stamens, their ovaries rudimentary or obsolete; pistillate occasionally with imperfect stamens. Ovary glabrous, stipitate, tapering into 2 rather long styles. (Greek distichlia, a double row, probably having reference to the leaf arrangement.)

1. **D. spicata** (L.) Greene. SALT-GRASS. Rootstock stout, creeping, scaly; stems stout, rigid, erect, 4 to 18 in. high, often branched below, leafy throughout; leaves pale green, strictly 2-ranked; sheaths glabrous, slightly bearded at the throat; ligule reduced to a mere ring; blade $1\frac{1}{2}$ to 4, rarely 7, in. long, $1\frac{1}{2}$ lines wide at the base, spreading, rigid, margins minutely ciliate; panicle 1 to 3 in. long, pale green; branches appressed, spikelet-bearing to the base; spikelets 4 to 6 lines long, 5 to 12-flowered, keeled; bracts shorter than the lowest bractlet, unequal, obtuse; bractlets keeled, obtuse, green, purplish or straw-colored; anthers purplish.—(*D. maritima* Raf.)

Common throughout the State, usually near salt water. Salt-marshes at San Francisco; Belmont; West Berkeley; Oakland; Alameda; Agnews; Martinez; Tomales Bay; Drake's Estero. Alkali

soils of the interior from Glenn Co. to Southern California: Little Oak and Davis Hills, Solano Co., *Jepson*; Livermore Valley. Apr.-Aug. Varying much in aspect according to habitat, in some situations being much shorter and more rigid, with shorter, stiffer, and more distinctly distichous leaves. Its occurrence in abundance appears to indicate the presence of brackish water near the surface. Sometimes affected by Ergot.

33. BRIZA L. QUAKING-GRASS.

Leaf-blades narrow. Panicle effuse, branches slender, in $\frac{1}{2}$ whorls. Spikelets pendulous, large, ovate or somewhat cordate, flattish-turgid, many-flowered; pedicels capillary. Bracts subequal, broad, rounded on the back, 3 or 5 to 11-nerved, awnless. Rachilla jointed between the flowers. Bractlets imbricate, roundish, boat-shaped or saccate, scarious-margined, many-nerved, in ours very obtuse; uppermost often empty; palea small, ovate, flat, its nerves ciliate. Scales 2, ovate-lanceolate. Stamens 3. Ovary glabrous; styles short. Achene strongly ob-compressed, broadly ovoid. (Ancient Greek name, used by Galen for a kind of grain, "like rye," grown in Thrace and Macedonia.)

Spikelets $\frac{1}{2}$ in. or less long.

Perennial; ligule $\frac{1}{2}$ to 1 line long; spikelets ovate; bracts not equaling the nearest bractlet; leaves smooth. 1. *B. media*.

Annual; ligule $1\frac{1}{2}$ to 3 lines long; spikelets deltoid; bracts exceeding the nearest bractlet; leaves scabrous. 2. *B. minor*.

Spikelets $\frac{1}{2}$ in. long and at the base almost as broad; bracts dark brown, with broad, scarious margins; bractlets chestnut-brown. 3. *B. maxima*.

1. *B. media* L., PERENNIAL QUAKING-GRASS, has been reported from San Francisco, *Bolander*, Santa Cruz, *Anderson*, and elsewhere, but all the specimens we have seen under this name are referable to *B. minor*.

2. *B. minor* L. ANNUAL QUAKING-GRASS. Annual; ligule $1\frac{1}{2}$ to 3 lines long; blades scabrous; spikelets deltoid, the bracts extending farther outward on each side than do the adjacent bractlets.

Naturalized at Mission Dolores, San Francisco, as early as 1866, *Bolander*; Mt. Tamalpais; Lake San Andreas; Mill Valley; Olema, and northward.

3. *B. maxima* L. RATTLESNAKE-GRASS. Annual, 16 to 24 in. high; spikelets $\frac{1}{2}$ in. long and almost as broad at the base; bracts dark brown, with broad, scarious margins; bractlets chestnut-brown.

Often cultivated as an ornamental grass; found as a garden escape near Healdsburg in 1896, said to have been there several years, Miss Alice King; near Monterey, Miss Eastwood.

34. DACTYLIS L.

Perennial. Panicle usually dense and branched, secund, glomerate and interrupted, bearing thick, crowded, secund fascicles of spikelets at the ends of the short branches. Spikelets sessile, laterally much compressed, somewhat concave on the inner side, 3 to 5 or rarely only 1-flowered, the terminal bractlet and palea empty. Bracts mucronate,

sharply keeled; lower 1-nerved; upper larger, 1 to 3-nerved. Rachilla glabrous. Bractlet larger than the bracts, sharply keeled and fringed on the keel, the 5 nerves converging into an awn-like, scabrid point; palea as long, 2-fid, 2-nerved, nerves ciliate. Scales 2, with an acute, marginal tooth. Stamens 3. Ovary glabrous. (The ancient name for some grass with finger-like spikes, from Greek *daktulos*, a finger or finger's breadth.)

1. *D. glomerata* L. ORCHARD-GRASS. Rootstock tufted and somewhat creeping; stems at length forming large, dense tufts, erect from a shortly decumbent, leafy base, 2 to 3 ft. high, stout; leaves glaucescent; sheaths scabrid; ligule $\frac{1}{4}$ to $\frac{1}{2}$ in. long, laciniate; blades 2 to $3\frac{1}{2}$ lines wide, scabrous, soft; panicle 2 to 6 in. long, pinkish when in flower; branches solitary, scabrous, sub-erect, the lowest 1 to 4 in. long, branching and spikelet-bearing only at the ends; clusters of spikelets ovoid; spikelets about 4 lines long; bracts about 3 lines long, subequal, strongly ciliate on the keel; bractlet 2 to 4 lines long, lanceolate, scabrid; anthers 1 to $1\frac{1}{2}$ lines long, cream-colored, apparently all in a spikelet maturing at the same time.

Native of Europe, naturalized near Berkeley, San Francisco, Olema, Eureka, and Crescent City. June-Aug.

35. LAMARCKIA Mœnch.

Annual. Stems tufted, branching. Leaves flat. Panicle secund, racemose, short, dense; lowest branches bearing 1 to 3, uppermost only 1, spikelet. Spikelets spreading or drooping, fascicled, of two kinds; central spikelet, terminating the branch, bearing a perfect flower; lateral spikelets of ten or more empty, obtuse, awnless bractlets, denticulate above. Bracts narrow, slightly unequal. Perfect flower stipitate; rachilla prolonged beyond it and bearing a diminutive empty bractlet with a slender awn; flower-enclosing bractlet acute with a long, straight, dorsal awn near the apex; palea 2-keeled. Stamens 3. Styles short, distinct, barbellate almost throughout. (A monotypic genus, named in honor of La Marck, 1744-1829, celebrated French botanist.)

1. *L. aurea* (Dalech.) Mœnch. GOLDEN-TOP. Stems erect from a somewhat decumbent base, 4 to 14 in. high, smooth, leafy, sometimes branching below; sheaths inflated, smooth; ligule usually very prominent, $\frac{1}{2}$ to 6 lines long, decurrent as a broad, scarious margin to the mouth of the sheath; blades thin, $1\frac{1}{2}$ to 4 in. long, $2\frac{1}{2}$ to 4 lines wide, panicle dense, 1 to 3 in. long, $\frac{1}{2}$ to 1 in. wide, shining, of a golden color sometimes tinged with purple; branches close, erect, short; pedicels fascicled, somewhat clavate, pubescent, spreading at right angles, the fascicles with a tuft of long, whitish hairs at the base; fertile spikelet about 1 line long; sterile 3 to 4 lines long; bracts very narrow, almost hyaline, about 1 line long; awn from a little below the apex of the bractlet, 3 to $4\frac{1}{2}$ lines long.—(*Achyrodes aureum* Ktze.)

A Mediterranean Region species, now abundant in the warm interior southern portions of the State; within our limits it appears

to have been found only once, near Eden Vale railroad depot, Santa Clara Co., in 1893, *Davy*. Mar.-June.

36. POA L. MEADOW-GRASS.

Panicle usually open, sometimes dense and spike-like; branches in pairs or $\frac{1}{2}$ whorls. Spikelets compressed, ovate or lanceolate, 2 to 6 or 9-flowered. Bracts unequal, keeled, awnless; lower 1 to 3-nerved; upper larger, 3-nerved. Rachilla jointed below each bractlet. Bractlet compressed-keeled, herbaceous or membranaceous, with the rachilla and callus often clothed below with webby hairs or pubescent, especially on the dorsal and marginal nerve; apex hyaline; nerves 5 to 7, the intermediate ones often faint; palea 2-fid, nerves 2, ciliate. Scales acute. Stamens 3 or (rarely) 2 only. Achene (in ours) mostly free from the bractlet and palea, not furrowed. (Greek *poe*, grass or herbage, especially that grown as forage for cattle, hence meadow-grass.)

Panicle open.

Annual; stems 2 to 12 in. high 1. *P. annua*.

Perennial; stems 12 to 36 in. high; rootstock distinctly stoloniferous and running 2. *P. pratensis*.

Panicle contracted, more or less dense and spike-like; perennials; flowers often dioecious or polygamo-dioecious

Rootstock running, long and slender; coast and sand-dunes . 3. *P. Douglasii*.

Rootstock tufted, not running.

Panicle 3 to $4\frac{1}{2}$ in. long; longest branches 1 to 2 in. long, spikelet-bearing on the upper three-fourths; bracts and bractlets not ciliate on the keels; bunch-grass of dry hillsides 4. *P. secunda*.

Panicle 2 to 3 in. long; longest branches less than 1 in. long, densely spikelet-bearing almost to the base; bracts and bractlets scabrously ciliate on the keels; moist sandy places on the coast cliffs.

5. *P. unilateralis*.

1. *P. annua* L. WALK-GRASS. Annual; stems compressed, weak, geniculate below, 2 to 12 in. high; ligule 1 to 2 lines long; blades bright green, glabrous, 1 to 2 lines wide; panicle often 1-sided, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; branches single or in pairs, rarely in threes, 7 to 12 lines long; spikelets sessile or shortly pedicellate, 2 to $2\frac{1}{2}$ lines long, 3 to 7-flowered; bractlets somewhat pilose below. Naturalized and widely distributed: Monterey, 1846-47, *Hartweg*; Berkeley; etc. A very troublesome weed on garden walks, hence the vernacular name; our earliest-flowering grass. Nov.-Apr.

2. *P. pratensis* L. KENTUCKY BLUE-GRASS. Perennial; rootstock distinctly running and stoloniferous; stem and sheaths smooth; panicle open-pyramidal, 3 to 4 in. long; spikelets crowded at the ends of the branches, almost sessile, 3 to 5-flowered; bractlet distinctly 5-nerved, webbed at the base.

Introduced within our limits; frequently met with as an escape from lawns: Berkeley. Apr.-May.

3. *P. Douglasii* Nees. SAND-GRASS. Perennial; rootstock slender, widely creeping; stems tufted, 8 in. high; panicle dense, spike-like, ovoid, obtuse, 1 to 2 in. long; spikelets 3 to 6 lines long; flowers dioecious.

Apparently peculiar to California, common in drifting sands along the seashore: Monterey; San Francisco; Tiburon; Point Reyes; Bodega Point and northward. Apr.

4. *P. secunda* Presl. Tufted perennial; stems stout, rigid, erect, about 1 ft. high; sheaths minutely scabrid above; ligule $1\frac{1}{2}$ to 2 lines long, acute, glabrous or minutely pubescent on the back; blades short, flat, $\frac{3}{4}$ to 1 line wide; panicle 3 to $4\frac{1}{2}$ in. long, oblong, acute, contracted, densish; branches scabrous, erect, overlapping, about 3 at a node, the longest 1 to 2 in. long, spikelet-bearing on the upper three-fourths; spikelets $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, lanceolate-acuminate, about 5-flowered; pedicels scabrous; bracts acute, scabrid, 3-nerved below, the nerves evanescent in the broad, scarious margin; lower $1\frac{1}{2}$, upper $1\frac{3}{4}$ lines long; bractlet 2 lines long, obtuse when flattened out, scabrid above, 5-nerved, pubescent on the nerves below, all but the mid-nerve evanescent below the broadly-scarious apex; palea $1\frac{3}{4}$ lines long, emarginate, ciliate on the keels; anthers purple, 1 line long; ovary $\frac{1}{4}$ line long, stigmas $\frac{1}{2}$ line, achene a little over 1 line.—(*Atropis Californica* Thurb. in Bot. Cal., in part; *A. Fendleriana* Beal, in part.)

One of the "bunch-grasses" of dry hillsides, apparently quite widely distributed, though perhaps often confused with other species. Antioch; Angel Island, etc.

5. *P. unilateralis* Scribn. Tufted perennial; rootstock stout, not creeping; stems stout, erect or ascending from a decumbent base, 6 to 10 in. high, freely branching below; sheaths smooth, inflated and loose; ligule $1\frac{1}{2}$ to 3 lines long, acute; blades 1 to 3 in. long, flat or conduplicate, $\frac{3}{4}$ to $1\frac{1}{4}$ lines wide, abruptly acute; panicle stout, contracted, dense and spike-like, 1 to 3 in. long, $\frac{1}{2}$ in. broad, often one-sided; branches densely spikelet-bearing almost to the base, scabrous; spikelets almost sessile, 2 to 4 lines long; bracts acute, $1\frac{1}{2}$ lines long, 3-nerved, ciliate scabrous on the keel, minutely ciliate on the margins; rachilla pubescent; flowers 4 to 7, imperfectly diœcious; bractlet 2 lines long, acute when flattened out, faintly 5-nerved, scabrously ciliate on the mid-nerve, not woolly below; palea 2-fid, strongly ciliate on the keels; anthers yellow or purplish, 1 line long.

Moist, sandy places on the coast bluffs north and south of San Francisco: Santa Cruz (type locality), *Anderson*; Point Reyes; Bodega Point; Point Arena. Apr.—June.

37. PANICULARIA Fabr. MANNA-GRASS.

Tall grasses of wet places. Stems smooth. Panicle-branches in $\frac{1}{2}$ whorls. Spikelets linear, sub-terete, many-flowered. Bracts not equaling the nearest bractlet, unequal, membranaceous, convex, awnless. Rachilla jointed below the bractlets. Bractlet caducous, cartilaginous, convex or flattish, not keeled; tip obtuse or slightly denticulate, usually scarious; nerves 3 to 9, conspicuous below, evanescent upwards; palea 2-fid, 2-keeled, nerves ciliate. Scales fleshy, united, truncate. Stamens 3. Ovary glabrous. (Latin

panicula, a tuft or panicle on plants, having reference to the inflorescence.)

1. *P. pauciflora* (Presl.) Ktze. SMOOTH MANNA-GRASS. Stout perennial of fresh-water marshes; rootstock stout, creeping; stems 2 to 4 ft. high, stout, sometimes $2\frac{1}{2}$ lines in diameter, erect from a decumbent base, rooting at the lower nodes, leafy throughout; leaves about 6; sheaths split to the base, loose, smooth, pale green; ligule broad, obtuse, entire but soon becoming lacerate, 1 to $3\frac{1}{2}$ lines long; blade 4 to 12 in. long, 3 to $7\frac{1}{2}$ lines wide, flat, scabrous; panicle lax, narrow, 6 to 8 in. long, pale green; branches in $\frac{1}{2}$ whorls of 2 to 5 below, capillary and flexuous, rough, erect, somewhat remote, spikelet-bearing above the middle, the longest about $3\frac{1}{2}$ in. long; pedicels short; spikelets oblong, 2 to $\cdot 3$ lines long, 4 to 6-flowered; bracts less than $\frac{1}{2}$ the length of the nearest bractlet; lower 1-nerved, acute; upper rounded, 3-nerved; bractlet about 1 line long, prominently 5-nerved, scabrous, with a purplish border below the scarious truncate-obtuse serrulate apex.—(*Glyceria pauciflora* Presl.)

A common grass in fresh-water marshes of the Coast Ranges and Sierra Nevada: Lake Pilarcitos; Olenia; Guerneville and northward. Apr.—Aug.

38. *FESTUCA* Tourn. FESCUE-GRASS.

Leaves and flowers often rather harsh to the touch. Panicle various, loose and spreading or racemose and sometimes secund. Leaf-blades often auricled at the base. Spikelets sub-terete, 2 to many (rarely by abortion only 1)-flowered. Bracts 2 (rarely only 1), not equaling the nearest bractlet, membranaceous, acute; lower 1-nerved; upper larger, 3-nerved. Rachilla jointed below the bractlets. Bractlets not webby, convex, not keeled, chartaceous or nearly coriaceous, 3 to 5-nerved, mucronate or awned at or near the tip, uppermost sometimes empty; palea 2-toothed or 2-fid, nerves hairy. Scales 2, notched or 2-lobed. Stamens 1 to 3. Ovary usually glabrous; styles short, terminal. (Latin *festuca*, a slender shoot, or straw; also used by Latin writers to designate some straw-like weed.)

Perennials. — EU-FESTUCA.

Stems less than 2 lines long.

Stems slender, $\frac{1}{2}$ to 3 ft. high; ligule and auricles glabrous; rootstock tufted, sometimes stoloniferous; lowest bractlet $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long.

1. *F. rubra*.

Stems stout, 3 to 4 ft. high; ligule and auricles villous . . . 2. *F. Californica*.

Awns 4 to 6 lines long . . . 3. *F. denticulata*.

Slender annuals; inflorescence a racemose panicle or raceme; awns $2\frac{1}{2}$ to 7 lines long. — VULPIA.

Branches and spikelets mostly spreading; the latter 1 to 5-flowered; bracts sub-equal, the lower $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long . . . 4. *F. microstachys*.

Branches and spikelets erect, appressed; spikelets 5 to 8 (rarely only 3)-flowered; bracts often very unequal, sometimes sub-equal . . .

5. *F. Myuros*.

1. *F. rubra* L. RED FESCUE. Rootstock perennial, tufted and sometimes stoloniferous; stems slender, erect, 2 to $2\frac{1}{2}$ ft. high, often

purplish; sheaths smooth; blades very narrow and slender, almost setaceous, smooth, about $\frac{1}{4}$ line wide, 4 to 10 in. long; ligule very short; panicle 6 to 7 in. long, narrow, sparse or somewhat dense; rachis and branchlets scabrid, the latter erect, in pairs below, the longest about 3 in. long and bearing 3 to 5 spikelets on the upper $\frac{1}{2}$; pedicels about 3 lines long; spikelets 6 to 7 lines long, 6 to 8-flowered; bracts awnless, the lower 2, upper $2\frac{1}{2}$ lines long; bractlets $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, glabrous or minutely scabrous above, with a slender awn 1 to $1\frac{1}{2}$ lines long; anthers $1\frac{1}{2}$ to 2 lines long.—(*F. ovina* var. *rubra* Gray.)

Common in dry, exposed places: Vaca Mts., *Jepson*; Los Guilucos Valley and Hood's Peak, *Bioletti*; Point Isabel; Olema; Point Lobos, San Francisco. Apr.–June.

2. ***F. Californica*** Vasey. CALIFORNIA FESCUE. Rootstock perennial, forming large tufts; stems clothed with the dead sheaths below, 3 to 4 ft. high, stout; foliage glaucous; sheaths often lavender-colored at the base when young, scabrous; ligule and auricles villous without and within; panicle 6 to 9 in. long, drooping; rachis scabrid; branches in pairs below, spikelet-bearing above the middle; spikelets about $\frac{1}{2}$ in. long, 4 to 7-flowered; lower bract 2 to $3\frac{1}{2}$, upper $2\frac{1}{2}$ to 4 lines long; bractlets cuspidate or with a short awn usually less than 1 line long, occasionally nearly 2 lines long; anthers purplish, $2\frac{1}{2}$ to 3 lines long.—(*F. scabrella* Thurb. in Bot. Cal., not of Hook.)

Forming large and ornamental tufts on the shady banks of cañons in the Coast Ranges: Claremont Cañon; Redwood Peak; Olema; Point Reyes. Apr.–June.

3. ***F. denticulata*** Beal, is described as a stout and rather handsome grass, with loose and drooping panicle and conspicuous awns 4 to 6 lines long. The specimens on which the species was founded (as *F. ambigua* Vasey, not of Le Gall) were collected in Oregon, *Howell*; "California," *Kellogg* and *Harford*, no. 1116, and Santa Cruz, *Anderson*.

4. ***F. microstachys*** (Munro) Nutt. WESTERN FESCUE. Annual; stems erect, 6 to 12, or in shady places, 24 in. high; panicle 1 to 4 in. long; branches secund, usually divergent, remote, the longest $1\frac{1}{4}$ to 2 in. long; spikelets remote, $2\frac{1}{2}$ to 5 lines long, 1 to 5-flowered; bracts glabrous or scabrous, awnless, sub-equal, lower $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; bractlet $1\frac{1}{2}$ to 2 lines long, awn slender, $2\frac{1}{2}$ to 4 lines long.

Napa Valley; Conn Valley Ridge; near Highland Springs; Berkeley; Mt. Tamalpais; Cazadero. Apr.–July. Var. **PAUCIFLORA** Scribn. Inflorescence often reduced to a spike; spikelets 1 to 2-flowered.—Berkeley Hills, *Davy*. Var. **CILIATA** A. Gray. Bractlets, and sometimes the bracts also, densely hispid.—Not uncommon in the foothills of the San Joaquin Valley and in Southern California; apparently seldom met with in the Coast Range valleys: Napa City, *Jepson*.

5. ***F. Myuros*** L. SQUIRREL-TAIL FESCUE. The form of this variable annual species which is recognized in Europe and the eastern

States as typical, *F. Pseudo-Myuros* Soyer-Willemet, does not appear to occur within our limits, if in California at all. It has the panicle 3 to 12 in. long, very slender and contracted; bracts unequal, the upper 2 to 3 times as long as the lower and usually little more than $\frac{1}{2}$ the length of the contiguous bractlet, exclusive of its awn; bractlet not ciliate. Var. *ciliata* Coss. is readily distinguished by the prominent marginal ciliation of the upper half of at least the uppermost bractlets, the marginal hairs being long, spreading and well exerted; bracts very unequal, the lower very short or minute, the upper 3 to 8 times longer, much as in var. *ambigua* Hook.; awn of the bractlet 3 to 7 lines long.—(*F. Myuros* of Thurber in Bot. Cal. not of L.)

Native of the Mediterranean Region, naturalized in California from Mendocino Co. to San Bernardino: San Francisco, 1865, *Bolander*; Little Oak, *Jepson*; Bodega Point, *Eastwood*; Berkeley Hills; Briones Hills; Antioch; Angel Island. Apr.—June.

Var. *sciuroides* Coss. Upper portion of the stem usually well exerted from the sheath; panicle shorter than in typical *F. Myuros*, usually 2 to 4 in. long, less contracted; bracts less unequal (in which it closely approaches *F. microstachys* Nutt.), lower 2 to 3 lines long, upper 4 lines long, nearly equaling the contiguous floret; bractlet glabrous below, minutely scabrous near the apex, not ciliate.—(*F. sciuroides* Roth.)—Closely related to the typical *F. Myuros*, but differing from it in most of the above points and from *F. microstachys* in the more numerous flowers to the spikelet and the erect branches and spikelets. Native of Europe; now thoroughly naturalized and common in middle California: Bodega Point, *Eastwood*; Berkeley; Oakland; Point Isabel; Briones Hills; Lake Merced; Presidio, San Francisco. Mar.—June.

39. *BROMUS* L. BROME-GRASS.

Sheaths often closed; leaf-blades flat. Panicle usually open; branches slender and at length spreading, rarely dense or racemed with erect branches. Spikelets 5 to many-flowered, laterally compressed or sub-terete, oval to lanceolate, erect or often drooping. Bracts not reaching to the apex of the lowest bractlet, membranaceous, acute, awnless; lower 1 to 5-nerved; upper 3 to 9-nerved. Rachilla jointed below the bractlets. Bractlets rounded on the back below, somewhat keeled above 5 to 9-nerved, awned or bristle-pointed; awn mostly arising from a little below the usually shortly 2-fid, hyaline apex. Palea nearly as long as the bractlet, 2-fid, with 2 prominent, usually pectinate-ciliate keels. Ovary obovate or linear, crowned by a 2 to 3-lobed, hairy, membranaceous appendage; styles very short, more or less lateral, plainly arising below the apex of the ovary; stigmas feathery. Achene oblong or linear, often more or less conduplicate, grooved, adhering to the palea or more or less to the base of the bractlet. (*Bromos*, the ancient Greek name for a kind of oats, derived from *broma*, food. Closely allied to *Festuca*.)

Lower bract 1 to 3-nerved.

Perennial; spikelets narrow, sub-terete, acuminate before anthesis; awns $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long 1. *B. tævipēs*,

Annual.

Bractlets 6 to 10; panicle contracted; awns slender, about $\frac{3}{4}$ in. long; ligule lacerate; panicle dense, obovate-cuneate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; awns 6 to 9 lines long 2. *B. rubens*.

Bractlets 4 to 6; panicle lax; awn stout, rigid, over 1 in. long 3. *B. maximus*.

Lower bract 5 to 9-nerved.

Annual; panicle-branches short, erect 4. *B. hordeaceus*.

Perennial; panicle-branches long, drooping at maturity.

Stems 3 to 4 ft. high; panicle erect; awn $3\frac{1}{2}$ to 7 lines long; bracts unequal, lower 4 to 6, upper 5 to 7 lines long; rachilla pubescent. 5. *B. carinatus*.

Stems $1\frac{1}{2}$ to 3 ft. high; panicle drooping; awn 2 to $3\frac{1}{2}$ lines long; bracts subequal, about 6 lines long; rachilla puberulent 6. *B. marginatus*.

1. *B. lævipes* Shear. NODDING BROME. Perennial; stems slender, erect from an arcuate base, 2 to 3 ft. high; sheaths smooth or scabrid; blades flat, scabrid, 2 to 3 lines wide; panicle lax, drooping, 5 to 8 in. long; branches bearing few spikelets; spikelets drooping, narrow, subterete, acuminate before anthesis, 12 to 16 lines long, 5 to 9-flowered; bracts smooth, 1 to 3-nerved; internodes of rachilla $\frac{1}{2}$ to $1\frac{1}{2}$ lines long; bractlets 5 to $7\frac{1}{2}$ lines long, 7-nerved, the alternate nerves longer and more prominent, densely ciliate-pubescent on the margin nearly to the apex, and also on the back near the base; apex nearly flat, entire; awn $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

San Pablo Ridge; Briones Hills; Hood's Peak, and northward in the Coast Ranges, in woodlands and among brush. May.

2. *B. rubens* L. RED BROME. Soft, densely tufted, slender annual, 8 to 16 in. high; ligule lacerate, 1 to 2 lines long; panicle obovate-cuneate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, erect, dense, tinged with reddish-brown, branches bearing 1 to 4 spikelets; spikelets 6 to 9-flowered; lower bract 3 to 5 lines long, lanceolate, 1-nerved, upper 5 to 7 lines long, 3-nerved; bractlets 7-nerved, awn 6 to 9 lines long.

Naturalized from southern Europe: Miller Cañon, Solano Co., Jepson; Briones Hills; Antioch. Apr.-May.

3. *B. maximus* Desf. BRONCHO-GRASS. Annual; stems 1 to 2 ft. high; ligule $1\frac{1}{2}$ to 2 or 3 lines long, truncate, lacerate; blades 2 to 3 lines wide, flat, bright green, sparsely villous; panicle 5 to 8 in. long, at first erect, then drooping; lowest whorls 4 to 5-branched; longest branches less than twice the length of the spikelet; spikelets solitary or in pairs, often $1\frac{3}{4}$ in. long excluding the awns, linear-lanceolate, very scabrous, often purplish; bracts scarious except the nerves, very narrow, awn-pointed, 1 to 3-nerved; lower 7 to 10 lines long; upper 11 to 14 lines long, long-acuminate; bractlets 4 to 6, thin, 7-nerved, 11 to 14 lines long with 2 long, hyaline teeth 2 to 3 lines long; awn $1\frac{1}{4}$ to 2 in. or more long, rigid, scabrous, arising from below the teeth; anthers $\frac{1}{2}$ line long, yellow.—(*B. rigidus* Beal, not of Roth.)

Native of the Mediterranean Region: naturalized "near the Mission Dolores, in a field under cultivation," Bolander, about 1862; Berkeley. San Francisco; Suisun Marshes; Briones Hills; San Jose; Tulare. Apr.-May. Now one of our most abundant grasses.

4. *B. hordeaceus* L. SOFT BROME. Annual, erect, 1 to $1\frac{1}{2}$ ft. high; whole plant excepting the stems and uppermost sheaths, softly

downy; ligule $\frac{1}{2}$ to $1\frac{1}{2}$ lines long, truncate, serrate, blades 2 to $4\frac{1}{2}$ lines wide; panicle 3 to 5 in. long, erect, rather dense; branches very short, erect; spikelets lanceolate, turgid, about 6 lines long, 5 to 9-flowered; bracts acute, with broad scarious margins and tips; lower 3 to 5-nerved; upper 7-nerved; bractlets closely imbricate, broadly oval, 7-nerved, margins and apex broadly scarious; awn from below the apex, slender, 1 to $2\frac{1}{2}$ lines long; palea distinctly ciliate; anthers yellow, $\frac{3}{4}$ line long.—(*B. mollis* L.)

Native of Europe, naturalized and very common by roadsides and in waste places within our limits and northward and southward: Berkeley; Oakland; Livermore; Evergreen; Brentwood; Antioch; Santa Rosa; Point Reyes; Morleys Station. May. Apparently introduced since the State Survey collections were made, as it is not included among the species enumerated in the State Survey publications. Sometimes called "Poverty-grass." Var. *GLABRESCENS* (Coss.) Shear, differs from the type in having the bractlet glabrous and shining or only scabrous. Common at Berkeley.

5. *B. carinatus* H. & A. Perennial; stems stout, strictly erect, 3 to 4 ft. high, the sheaths almost closed, the lower hirsute with long, retrorsely spreading hairs or scabrid, upper sometimes glabrous; ligule about $2\frac{1}{2}$ lines long; blades 4 to 6 lines wide near the base, often hairy above; panicle 9 to 12 in. long; lower branches 4 or 5, in half whorls, long, scabrous, becoming drooping, shortly branched and bearing their few spikelets only above the middle; spikelets compressed, oblong, 12 to 15 lines long, 7 to 10-flowered; bracts unequal, lower 4 to 6, upper 5 lines long, 3 to 7-nerved; rachilla pubescent; bractlets 7 to 8 lines long, about 7-nerved, densely and minutely pubescent and scabrous; awn $3\frac{1}{2}$ to 7 lines long; anthers bright yellow.

Common in the Coast Ranges of middle California: near Guerneville; Berkeley; Olema, etc. May.

6. *B. marginatus* Nees. Near to the preceding, but smaller in every way; stems slender, $1\frac{1}{2}$ to 3 ft. high, often drooping; sheaths more or less hirsute, prominently ciliate at the throat; panicle 4 to 9 in. long; spikelets more slender, 6 to 9 lines long, mostly 6 (rarely 10)-flowered; bracts sub-equal, about 6 lines long; rachilla puberulent; bractlets closely imbricate; awn 2 to $3\frac{1}{2}$ lines long.—(*Ceratochloa breviaristata* Hook.)

Common in the Coast Ranges from San Francisco and Berkeley to Eureka. May.

TRIBE 8. *Hordeæ*. BARLEY TRIBE.

Inflorescence a simple, bilateral spike (rarely normally racemose or paniculate in some species of *Hordeum* and *Elymus*, and abnormally in monstrosities or luxuriant cultivated varieties of these and other genera). Rachis often flexuous, more or less flattened and toothed or deeply notched at the nodes; often, but not always, jointed at the

nodes so that at maturity the internodes fall away with the attached spikelet; when the rachis is not jointed the rachilla is jointed above the bracts. Spikelets (in ours) in 2 opposite rows, solitary or 2 or more side by side at each node, sessile or very rarely pedicellate, all perfect or polygamous or when there are three at a node the central perfect or polygamous the two lateral sometimes imperfect, 1 to many-flowered, when many-flowered the uppermost flowers imperfect.

A. Spikelets sessile.

Spikelets solitary at the nodes of the rachis.

Flowers 1 or 2 in a spikelet; spike slender, the spikelets deeply sunk in notches of the rachis.—Subtribe *LEPTURÆ*.

Bractlet awnless; callus naked 40. *LEPTURUS*.

Bractlet awned; callus hairy 41. *SCRIBNERIA*.

Flowers 3 or more in a spikelet.—Subtribe *TRITICEÆ*.

Spikelets placed edgewise to the rachis, so that the backs of one row of bractlets are turned toward the notch; bract 1 only, except in the terminal spikelet 42. *LOLIUM*.

Spikelets placed flatwise to the rachis so that one side of each row of bractlets is turned towards the notch; bracts 2 to each spikelet 43. *AGROPYRON*.

Spikelets 2 or more side by side at the nodes of the rachis.—Subtribe *ELYMÆ*.

Flowers 2 or more in each spikelet; rachis jointed at the nodes or not.

Bracts but little smaller than the bractlets 44. *ELYMUS*.

Bracts minute, or obsolete and leaving only scars 45. *ASPERELLA*.

Flowers solitary in each spikelet; rachis jointed at the nodes, each internode at maturity falling away with the attached spikelet . . . 46. *HORDEUM*.

B. Spikelets, at least the lateral ones, pedicellate.

Flowers 2 or more in each spikelet; rachis jointed at the nodes or not 44. *ELYMUS*.

Flowers solitary in each spikelet; rachis jointed at the nodes, each internode at maturity falling away with the attached spikelet . . . 46. *HORDEUM*.

40. LEPTURUS R. Br. HARD-GRASS.

Ours slender, branching annuals. Inflorescence a simple, terminal, slender, cylindrical, jointed spike, at maturity each internode separating with the attached spikelet. Spikelets sessile, distichous, alternate, solitary in the notches of the axis, their backs turned towards the notches; uppermost spikelet terminal. Bracts 1 or 2, exceeding the bractlet, approximate in the lower, opposite in the upper spikelet, sub-equal, hard and rigid, narrow, 5-nerved, acute, awnless, one spreading when in flower. Flowers 2, or 1 with an empty bractlet above it. Bractlets sub-equal, hyaline, acute (in ours), awnless. Palea 2-nerved. Scales entire, glabrous. Stamens 3 or fewer. (Greek *leptos*, slender, *oura*, tail, referring to the slender, tail-like spikes.)

1. *L. cylindricus* Trin. CYLINDRICAL HARD-GRASS. Stems 12 to 14 in. high; spike 3 to 6 in. long, stout, cylindrical, straight; lateral spikelets with only 1 bract; bractlets acute.

Native of the Mediterranean Region; introduced along the coast near San Francisco: Tiburon, 1886, *Greene*; Petaluma Marshes, 1896, *Leckenby*; San Pablo and Pinole Cañons, in adobe soil, abundant, 1900, *Davy*. June–July.

2. *L. incurvatus* (L.) Trin. CURVED HARD-GRASS. Usually has a more slender, incurved spike, with the lateral spikelets subtended by 2 bracts.

An introduced weed, native of the Mediterranean Region: between Bolinas and Olema, 1886, *Greene*; South San Francisco, 1891, *Brandege*; Martinez; Point Reyes, *Davy*; reported also from Tiburon, *Behr*. June-July.

41. SCRIBNERIA Hackel.

A low, slender, erect, tufted annual. Inflorescence a strict, slender, jointed spike, breaking up at maturity. Spikelets 1-flowered, sessile and half embedded in the notches of the rachis, solitary or rarely in pairs, alternate, long and slender. Bracts much exceeding the bractlet, persistent, unequal, linear-lanceolate, acute, awnless, eccentrically keeled, very rigid; upper 3 to 5-nerved, lower 2 to 3-nerved and ribbed. Rachilla very short, jointed above the bracts, with a ring of hairs surrounding the base of the bractlet, prolonged as a minute hairy point. Bractlet and palea sub-equal, keeled; bractlet chartaceous, 1-nerved, toothed at apex and bearing a stout awn about its own length from between the teeth; palea hyaline, 1-nerved, acuminate and deeply 2-fid. Scales obsolete. Stamen 1. Ovary glabrous, narrowly obovate; stigma short, sessile, feathery. Achene linear-tapering, obtuse, free, slightly compressed laterally, not grooved; embryo prominent. (In honor of F. Lamson-Scribner, Agrostologist to the United States Department of Agriculture.)

1. *S. Bolanderi* (Thurb.) Hackel. SCRIBNERIA. Stems 2 to 6 in. high, mostly simple, leafy; sheaths striate; ligule prominent, 1 to 2 lines long, acute; blades $\frac{2}{3}$ to $\frac{5}{8}$ -in. long, narrow, involute, acute; spike $\frac{3}{4}$ to 2 or $4\frac{1}{2}$ in. long, erect, slightly flexuous or curved, purplish; spikelets about 3 lines long, usually exserted, scabrid.—(*Lepturus Bolanderi* Thurb.)

Found in dry gravelly soils on hillsides and roadsides from Lake and Mendocino Cos. northward to Oregon, and in the Sierra Nevada: Russian River Valley, Long Valley and Round Valley, Mendocino Co., 1866, *Bolander*; Yreka; Lakeport; Mariposa Co. Apr.-May. Not recorded from within our limits, but to be looked for in Sonoma Co., in the upper Russian River Valley.

42. LOLIUM L. RAY-GRASS.

Leaf-blades flat. Spike simple, solitary; rachis not jointed at the nodes. Spikelets in notches excavated alternately on opposite sides of the rachis, with the backs of one row of bractlets turned towards it, 3 to several-flowered, flattened laterally. Bracts 2 in the terminal spikelet, only 1 (the outermost) or 1 and a rudiment in the lateral spikelets. Rachilla jointed. Bractlet firm, 5-nerved. Palea ciliate. Stamens 3. Scales 2, mostly as long as the ovary. Ovary smooth or slightly downy at top; styles very short; stigmas feathery. (*Lolium*, the name used by ancient Latin writers to designate Darnel, *Lolium temulentum*, and perhaps other grain-field weeds. At once distinguished from all other genera of the tribe Hordeæ by the solitary, flat spikelets, arranged distichously with one edge towards the rachis.)

Bract shorter than the much flattened spikelet 1. *L. perenne*.

Bract equaling or exceeding the turgid spikelet 2. *L. temulentum*.

1. **L. perenne** L. ENGLISH PERENNIAL RAY-GRASS. Perennial; stems 1 to 2 or even 3 ft. high, smooth; foliage dark-green; sheaths smooth, slightly compressed; ligule short; edges and upper surface of blade scabrid; spike 4 to 12 in. long, strict, stout, bearing 6 to 10 spikelets, or slender and bearing 3 to 4 spikelets; rachis smooth, channeled; spikelets $\frac{1}{3}$ to $\frac{1}{2}$ in. long, quite smooth, shining, 7 to 11-flowered; bracts strongly ribbed, linear-lanceolate; bractlet linear-oblong, terete, obtuse or cuspidate or rarely very shortly awned, ribbed; anthers purple. Introduced by roadsides and in waste places: Berkeley; Point Reyes, etc. Feb.-Aug.

Var. **tenue** Kunth (L. *tenue* L.). PACEY'S RAY-GRASS. Perennial; more slender than the species; spikelets 3 to 4-flowered; bractlet acute, rarely very shortly awned.

Var. **Italicum** Hook. (L. *Italicum* R. Br.). PERENNIAL ITALIAN RAY-GRASS. Biennial or perennial; stems taller, leaves broader; both leaves and spikelets lighter green in color than in the species; spikelets 5 to 10-flowered; bractlets long- or short-awned. It is a cultivated form not known in the wild state except as naturalized.

Var. **multiflorum** Auct. (L. *multiflorum* Lam.). ANNUAL ITALIAN RAY-GRASS. Annual (or at most only biennial); spikes very handsome, often reddish-tinged and curved; spikelets 13 to 25-flowered; bractlet of uppermost flowers awned; bractlet broader in the middle, and therefore appearing more curved on the margins, than in var. *Italicum*; rachis more scabrous.—Cloverdale; Berkeley.

2. **L. temulentum** L. DARNEL. POISON-DARNEL. Annual; stem stout, 1 to 3 ft. high; spike rather stout; spikelets 5 to 7-flowered; bract sharp-pointed, not ribbed, extending to the apex of or beyond the uppermost bractlet; bractlet shorter, broader and more turgid than in *L. perenne*, terminating in an awn as long as the spikelet, or sometimes short-awned or awnless (var. *arvense* Syme.); in other respects similar to *L. perenne*.

Naturalized from Europe: Berkeley; San Francisco; Antioch; Briones Hills; Point Reyes and elsewhere; not uncommon as a weed in waste places. May.

43. **AGROPYRON** J. Gaertn. WHEAT-GRASS.

Ours perennials with very short ligule. Inflorescence a simple, slender, stiff and erect spike. Spikelets 3 to many-flowered, large, solitary, sessile, inserted broadside or somewhat obliquely to the rachis, distichous, compressed. Bracts not equaling the nearest bractlet, unequal, lanceolate or linear, many-nerved. Bractlet coriaceous, 5 to 7-nerved. Palea hyaline, flattened, usually ciliate-keeled. Scales ovate, entire, ciliate. Stamens 3. Ovary hairy at the apex; styles very short, distinct; stigmas distant, feathery. Achene hairy at apex. (The Greek name for some allied grass, from agros, field, puros, wheat,—hence field- or wild-wheat.)

Bractlet long-awned.

Bracts awnless; awns of bractlet 8 to 18 lines long . . . 1. *A. scabrum*.

Bracts shortly awned; awn of bractlet 6 to 7 lines long . . . 2. *A. Richardsoni*.

Bractlet awnless or with a very short awn; bracts more than $\frac{2}{3}$ the length of the spikelet.

Rootstock tufted, not stoloniferous 3. *A. tenerum*.
Rootstock long, slender, running and stoloniferous 4. *A. arenicolum*.

1. **A. scabrum** Beauv. AUSTRALIAN WHEAT-GRASS. Stems stout, erect, 2 to 3 ft. high; blades short, involute, smooth below; spike 8 to 16 in. long; spikelets 10 to 14 in number, 1 to $1\frac{1}{4}$ in. long excluding awns, narrow, 6 to 10-flowered, the lowest $\frac{3}{4}$ to $1\frac{1}{2}$ in. apart; bracts about 7 lines long, awnless, cartilaginous, pale green, with broad, scarious margins, smooth or minutely and sparsely scabrid, striate; bractlet chartaceous, with a broad, scarious margin, minutely scabrid; awn 8 to 18 lines long, mostly flexuous and widely divergent.

A pale, glaucous, Australian species, sparingly introduced into California: San Jose, 1879, *Miss Norton*; also reported by Bolander from "very dry hillsides, south side of Eel Ridge, Mendocino Co., June 15, 1867," and "in gardens near San Francisco."

2. **A. Richardsons** (Trin.) Schrad. RICHARDSON'S WHEAT-GRASS. Stems stout, sub-solitary, erect, 3 to $3\frac{1}{2}$ ft. high; blades 2 to 6 in. long, $2\frac{1}{2}$ lines wide, setaceous-pointed, scabrous above, smooth below; spike 5 to 7 in. long; lowest spikelets about $\frac{1}{2}$ in. apart; spikelets 6 to 7 lines long without the awn, 3 to 4-flowered; bracts 5 to 7 lines long without the awn, scabrous on the many nerves, their awns about $2\frac{1}{2}$ lines long; awn of the bractlet 6 to 7 lines long, erect.

Oakland, *Bolander*; probably introduced, apparently not since collected. July.

3. **A. tenerum** Vasey. SLENDER WHEAT-GRASS. Rootstock tufted, not stoloniferous; stems slender, erect, from a slightly ascending, leafy base, 14 to 20 in. high; blades 1 to 6 in. long, 1 to $1\frac{3}{4}$ lines wide, flat, rough; spike $3\frac{1}{2}$ to 5 in. long; spikelets 13 to 16; bracts more than $\frac{2}{3}$ the length of the spikelet, awnless or awn-pointed, glabrous, scabrously-ciliate, broadest below the middle. — (*A. repens* var. *tenerum* Beal.)

San Mateo, *Bolander*.

4. **A. arenicolum** Davy, sp. nov. DUNE WHEAT-GRASS. Rootstock long, slender, creeping and stoloniferous; stems 6 in. high, erect or arcuate at base, clothed with dead sheaths below; branches intravaginal; sheaths glabrous; ligule reduced to a ring $\frac{1}{3}$ line long; blades convolute, glabrous below, above clothed with a sparse pubescence and deeply channeled, 6 to 10 in. long, 2 lines wide, auricled at base, the auricle prolonged into a curved horn; spike $1\frac{1}{2}$ to 2 in. long; rachis almost smooth; spikelets approximate, $\frac{1}{2}$ in. long, 4 to 5-flowered; bracts 5 to $5\frac{1}{2}$ lines long, long-acuminate, subulate-pointed, ciliate, 3 to 5-nerved, coriaceous; bractlets broad, subulate-pointed, scabrid, coriaceous; palea ciliate.

A dwarf maritime species, apparently rare: type locality, sand-dunes at Point Reyes, *Davy*, no. 6879; Bodega Point, *Eastwood*.

44. **ELYMUS** L. WILD RYE.

Perennials; stems tall and rigid. Leaf-blades usually broad.

Spikes stout, cylindrical, usually dense. Spikelets 2 to 6 (sometimes only 1 above) at each node of the more or less flattened and notched rachis, placed sideways to the rachis, usually sessile, 2 to 7 (rarely only 1)-flowered. Bracts persistent, placed side by side in front of each spikelet so that those at a node together resemble an involucre, rarely divided into several awns (section *Sitanion*), firm, 1 to 5-nerved, linear or narrowly lanceolate-subulate. Rachilla jointed below the bractlets, terminating in a perfect or staminate flower or an empty bractlet. Bractlets usually coriaceous, rounded on the back. Palea 2-keeled. Scales large, usually ciliate. Stamens 3; anthers large. Ovary hairy; stigmas sessile or nearly so, distant. Achene oblong, hairy at the apex, grooved on the inside, adherent to the bractlet and palea. (Greek *elumos*, a kind of grain.)

Bractlet cuspidate or awn-pointed, but not long-awned.

Spikelets $\frac{3}{4}$ to 1 in. long; lowest bractlet 7 to 10 lines long; ligule about $\frac{1}{2}$ line long; stout grass of maritime dunes and sandy beaches. 1. *E. arenarius*.

Spikelets $\frac{1}{2}$ to $\frac{3}{4}$ in. long; lowest bractlet 5 to 6 lines long.

Ligule about 1 line long; spike stout, usually dense, contracted; spikelets many; stout grass of moist places among the hills. . . . 2. *E. condensatus*.

Ligule about $\frac{1}{3}$ line long; spike slender; spikelets few; plant usually glaucous with a bluish bloom; slender grass of bottom lands in the warmer valleys 3. *E. triticoides*.

Bractlet with an awn mostly equalling or longer than itself.

Bracts entire, narrowly lanceolate-subulate, mostly acuminate or awn-pointed but not long-awned.

Rootstock stoloniferous.

Awns erect; sheaths glabrous or retrorsely pubescent.

Ligule less than $\frac{1}{2}$ line long, regularly truncate.

Sheaths densely retrorsely pubescent 4. *E. pubescens*.

Sheaths smooth or scabrid 5. *E. glaucus*.

Ligule about 1 line long, rounded; bractlet hispidulous. 6. *E. hispidulus*.

Awns very divergent when dry, straight and erect when moistened; lower sheaths densely retrorsely pubescent 7. *E. divergens*.

Rootstock not stoloniferous; stems leafy and tufted. . . . 8. *E. angustifolius*.

Bracts divided into long, slender awns which surround the spikelets as with an involucre. 9. *E. Sitanion*.

1. *E. arenarius* L. RANCHERIA-GRASS. Glaucous; rootstock stout, widely creeping, stoloniferous; stems stout, erect, 3 to 6 ft. high; sheaths smooth, channeled; ligule a narrow truncate ring; blades 13 to 18 in. long, 4 to 6 lines wide, flat or with more or less convolute margins below, attenuate, rigid, auricled at the base, scabrous above, smooth below; spike 6 to 12 in. long, dense, erect; rachis broadly winged, pubescent and ciliate; spikelets large, in pairs or threes, imbricate, mostly appressed, $\frac{3}{4}$ to 1 in. long, about 6-flowered; bracts sub-equal, 7 to 12 lines long, rather shorter than the nearest bractlet, lanceolate-acuminate, 3 to 5-nerved, scabrous, sparingly ciliate with long hairs on the mid-nerve especially above; bractlet about 9 lines long including the long point, $1\frac{1}{2}$ lines wide, 8 to 9-nerved, glabrous or scabrid or sparingly pubescent; palea about 6 lines long, ciliate on the keels; anthers 3 lines long.

Common on maritime sand dunes, sandy beaches, and coast bluffs: Cliff House and South Beach, San Francisco; Alameda Marshes; Bay Farm Island; West Berkeley; cliffs at mouth of Bear Valley; Point Reyes. July-Aug.

2. **E. condensatus** Presl. CALIFORNIA WILD-RYE. Rootstock stout, creeping and stoloniferous; stems stout, erect, 3 to 6 ft. high; sheaths smooth; ligule about 1 line long, rounded, fimbriate; blades about 12 in. long, 4 to 5 lines wide, flat with more or less involute edges below, long-acuminate, smooth below, scabrous above; spike 5 to 8 in. long, compact, erect; rachis scabrous on the narrow wings; spikelets imbricate, appressed, in pairs, threes, or rarely more, when more than three then sometimes 1 or 2 are pedicellate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, somewhat turgid, 4 to 5-flowered; bracts subulate, rather shorter than the nearest bractlet, scabrid, about 6 lines long; bractlet scabrid at the apex, pulverulent below, more or less shining; lowest about $5\frac{1}{2}$ lines long, including the very short point, less than $1\frac{1}{2}$ lines wide, 7-nerved; palea $5\frac{1}{2}$ lines long; keels glabrous below, scabrous and ciliate above; anthers 2 to $2\frac{1}{2}$ lines long; scales about $\frac{3}{4}$ line long, ovate, ciliate.

Moist places among the hills of the Coast Ranges; not uncommon within our limits: along the lower Sacramento River, *Jepson*; Oakland Marshes, *Bolander*; Port Costa; Berkeley Hills; near Petaluma. Apr.—Sept. Type locality, Monterey, *Hornke*, 1791.

3. **E. triticoides** Buckl. SLENDER WILD-RYE. Usually glaucous throughout; rootstock slender, creeping; stems slender or stoutish, erect, 2 to $3\frac{1}{2}$ ft. high; sheaths smooth; ligule reduced to a narrow, truncate, fimbriate ring; blades 6 to 12 in. long, $3\frac{1}{2}$ lines wide, flat or involute, scabrous on the margins and nerves especially above; spike about 6 in. long, erect, somewhat lax; rachis with a narrow, ciliate wing, puberulent; spikelets distant above and below, overlapping in the middle, somewhat divergent, in pairs or threes below, solitary above, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, turgid, 4 to 6-flowered; bracts sub-equal, 5 to 7 lines long, longer than, or equalling the nearest bractlet, acuminate-subulate, scabrous on the nerves above; bractlets 3 to 5 lines long including the point, $1\frac{1}{2}$ lines wide, 9-nerved, glabrous; palea $3\frac{1}{2}$ to 4 lines long, scabrous on the keels; anthers $2\frac{1}{2}$ lines long.

Apparently preferring bottom lands in the warmer valleys, sometimes in alkaline soils: Little Oak, *Jepson*; San Jose; Princeton. May–June.

4. **E. pubescens** Davy, sp. nov. PUBESCENT WILD-RYE. Erect perennial; rootstock stoloniferous; stems 2 to 3 ft. high, erect, slender, scabrid; sheaths densely retrorsely pubescent; ligule reduced to a truncate ring about $\frac{1}{2}$ line long, fimbriate in young leaves; blades 3 to $6\frac{1}{2}$ in. long, 2 to 3 lines wide, flat, auricled at base; spike 3 in. long; rachis with a narrow, ciliate wing; spikelets in pairs or often solitary, 4 to 5 lines long, few-flowered; bracts broadly linear-lanceolate, 5 lines long, about 1 line wide, scabrid; lowest bractlet $4\frac{1}{2}$ lines long, scabrid; awn scabrid, $1\frac{1}{2}$ lines long; palea $3\frac{1}{2}$ to 4 lines long; anthers 1 line long; scales less than $\frac{1}{2}$ line long.

Type locality: Point Reyes, in a swale facing the ocean; apparently rare. July.

5. **E. glaucus** Buckl. GLAUCOUS WILD-RYE. Erect perennial; rootstock stoloniferous; stems tufted, erect from a more or less arcuate

base, $2\frac{1}{2}$ to 3 ft. high, smooth; branches 2 to 3 from the base of each stem; sheaths smooth or minutely scabrid; ligule regularly truncate, entire, less than $\frac{1}{2}$ line long; blade flat, narrower than the sheath, auricled at the base, scabrid on both surfaces or the lower glabrous, 3 to 5 or rarely in very luxuriant specimens $7\frac{1}{2}$ lines wide, acute; uppermost $2\frac{1}{2}$ to 4 in. long, lowest about 8 in. long; spike linear, erect, $2\frac{1}{2}$ to 5 or rarely 7 in. long, $2\frac{1}{2}$ to 4 lines wide; rachis scabrid on the margins; spikelets in pairs, rarely threes, appressed, 4 to 6 lines long excluding awns, 3 to 4-flowered; bracts lanceolate, 4 to 6 lines long, acuminate or awn-pointed, with 2 to 4 prominent scabrid nerves; bractlets scabrid above, 5-nerved, lowest $4\frac{1}{2}$ to 6 lines long, tapering into a straight, erect, scabrid awn $3\frac{1}{2}$ to 7 lines long; palea $4\frac{1}{2}$ to 5 lines long, scabrid, slightly emarginate; scales $\frac{1}{2}$ to 1 line long, lanceolate, acute, toothed on one side or the margins regularly curved, sparingly ciliate; anthers nearly $1\frac{1}{2}$ lines long, purplish; achene $2\frac{1}{2}$ to 3 lines long.

Thickets on open hillsides along the coast, common within our limits: San Francisco, *Bolander*; Point Reyes; Berkeley. June-July.

Var. *breviaristatus* Davy, var. nov. Bracts 6 to 9 lines long; awn of the bractlet 0 to 3 lines long.—Type locality: Point Reyes, *Davy*, among sedges and brambles in swales; Bodega Point, *Eastwood*. June-July.

Var. *Jepsoni* Davy, var. nov. Lowest leaves retrorsely pubescent.—Napa Valley, *Jepson*.

Var. *tenuis* Vasey, is much more slender in every way; spikes $1\frac{1}{2}$ to $2\frac{1}{2}$ lines wide.—It is not definitely recorded from within our limits, but occurs in the Sacramento Valley northward to Mt. Shasta, *Palmer*; Princeton. May.

Var. *maximus* Davy, var. nov. Tall and stout; leaf-blades $5\frac{1}{2}$ to $8\frac{1}{2}$ lines wide, sometimes glabrous in age; spike 7 in. long, 4 lines wide, slightly drooping above; spikelets mostly 6-flowered; bracts 7 to 9 lines long, often 5-nerved; awn of the bractlet very variable, 4 to 12 lines long.—Napa Valley, *Jepson*; Bodega Point, *Eastwood*.

6. *E. hispidulus* Davy, sp. nov. **HISPID WILD-RYE.** Rootstock stoloniferous; stem erect from a more or less arcuate base, about 3 ft. high, rooting and branching from the lowest nodes; lowest sheaths scabrid, uppermost retrorsely hispidulous; ligule of uppermost leaves entire, rounded, about 1 line long; blades narrower than the sheath, auricled at the base, scabrid on both surfaces and sparsely pubescent below, $1\frac{1}{2}$ to 4 lines wide, 6 to 7 in. long; spike $4\frac{1}{4}$ in. long excluding awns, 5 lines wide; spikelets in pairs, ascending, not closely appressed, 4 to 6-flowered, the longest 10 lines long excluding awns; lowest internode of the rachilla about 1 line long, pubescent; bracts $5\frac{1}{2}$ lines long, lanceolate-subulate, awn-pointed, 3-nerved, scabrous; lowest bractlet 7 lines long with an awn its own length, hispidulous above, 5-nerved, palea $\frac{1}{2}$ line shorter, pubescent and emarginate above, scabrid on the keels; scales $\frac{3}{4}$ to 1 line long, pubescent and ciliate, unevenly lobed near the base on one side only; anthers $1\frac{1}{2}$ lines long.

Type locality: Olema, Marin Co., Aug. 1898, *Dary*, no. 4306b. Near to *E. glaucus* var. *pubescens*, differing in the longer and rounded ligule, the hispidulous clothing to the sheaths which is less abundant on the lowest than on those above, and the hispidulous bractlets.

7. *E. divergens* Dary, sp. nov. DIVERGENT WILD-RYE. Perennial; rootstock short, very stout and woody, not stoloniferous; stems stout, erect, 2 to $2\frac{1}{2}$ ft. high; sheaths densely, or the uppermost sparsely, antrorsely pubescent; ligule $\frac{1}{2}$ line long, regularly truncate; blades flat or becoming involute, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines wide, pubescent on both surfaces or the uppermost glabrous on the lower surface; those of the lowest cauline leaves about 12 in. long, those of the uppermost $2\frac{1}{2}$ to 4 in. long; peduncle glabrous; spike 4 to 6 in. long, slender; rachis slender, continuous; spikelets in pairs, sessile, few-flowered; bracts broad, acuminate-pointed, $\frac{1}{2}$ in. long, and $\frac{1}{2}$ line wide at the middle, channeled; bractlet 5 lines long, excluding its awn, scabrid; awn 6 to 12 lines long, scabrous, hygroscopic, very divergent when dry, straight and erect when moist; palea 4 to 5 lines long, truncate, scabrous on the margins; achene 3 lines long.

Type locality: on a dry bank by the roadside near Petaluma, Sonoma Co., Sept. 18, 1897, *Dary*, no. 4037; common on dry, brushy hillsides, Point Reyes, July, 1900.

8. *E. angustifolius* Dary, sp. nov. NARROW-LEAVED WILD-RYE. Slender, erect perennial, forming low, leafy tufts; rootstock apparently not stoloniferous; stems erect from a more or less arcuate base, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, smooth, rooting and branching freely at the lowest nodes; uppermost sheaths glabrous, lowest and those of the branches densely retrorsely scabrous and ciliate on the margins, or glabrous; ligule regularly or somewhat obliquely truncate, $\frac{1}{4}$ line long; blades flat, or involute when dry, $1\frac{1}{2}$ or rarely $2\frac{1}{2}$ lines wide, sparingly pubescent and scabrid on the upper surface, antrorsely scabrid on the lower, much narrower at the base than the sheath and strongly auricled; lowest cauline blades 7 to 8 in. long, uppermost about 4 in. long; spike lanceolate-linear, $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, 3 to 5 lines wide; rachis scabrous on the margins; spikelets in pairs, ascending or appressed, $4\frac{1}{2}$ to 7 lines long excluding awns, and slightly exceeding the internodes, 3 to 4-flowered, uppermost flower imperfect or sterile; bracts narrow-lanceolate to linear, acute, $4\frac{1}{2}$ to 5 lines long, 3 to 4-nerved and ribbed, scabrid on the nerves; bractlet 4 to $5\frac{1}{2}$ lines long excluding the awn, 5-nerved, scabrid; awn erect or somewhat spreading, $1\frac{1}{2}$ to 4 lines long, strongly scabrid; palea 4 to $4\frac{1}{2}$ lines long, slightly emarginate, ciliate, scabrous on the keels; stamens 3; scales $2\frac{3}{4}$ line long, oblique or truncate notched or lobed on one side near the base, obtuse; anthers $1\frac{1}{2}$ lines long; ovary clavate; stigmas 1 line long, plumose.—(*E. Sibiricus* Thurb., in Bot. Cal. in part, not of L.)

Common on dry hillsides in the Coast Ranges: San Francisco; Berkeley; Point Isabel. Apr.—June. Near to *E. glaucus* var. *tenuis* Vasey, but at once distinguishable by its more tufted and leafy habit, by the usually narrower leaf-blades and by the shorter and relatively stouter spikes.

Var. *cæspitosus* Davy, var. nov. TUFTED WILD-RYE. Densely tufted perennial; rootstock not stoloniferous; stems slender, erect, densely clothed below with dead sheaths, 8 to 14 in. high; branches very numerous from the base, the longest about 6 in. long; all the sheaths glabrous throughout, the lowest minutely punctate, prominently striate; ligule reduced to a narrow truncate ring; blades short, flat, or becoming somewhat involute when dry, 1 line wide at the base, glabrous except on the scabrid margins; uppermost cauline 1 to $1\frac{1}{2}$ in. long, lowest cauline $4\frac{1}{2}$ in. long; peduncle glabrous, spike well exserted, 2 to $2\frac{1}{2}$ in. long, narrow; spikelets in pairs, sometimes one of them rudimentary, 2-flowered; bracts acute, $3\frac{1}{2}$ lines long, $\frac{1}{2}$ line wide, glabrous; bractlet $3\frac{1}{2}$ lines long, terminating in an erect, minutely scabrid awn $2\frac{1}{2}$ to 4 lines long; palea about equaling it in length; achene $2\frac{1}{4}$ lines long.

Type locality: Berkeley Hills, *Davy*.

9. *E. Sitanion* R. & S. Stems 1 to 2 ft. high; sheaths smooth; spikes 4 to 7 in. long including the long awns, jointed at the nodes of the rachis and readily breaking up at maturity; spikelets mostly in pairs; bracts mostly 2-parted to the base, rarely entire, the divisions again unequally 2-cleft, passing insensibly into awns 1 to 3 in. long. —(*Sitanion elymoides* Raf.)

A very variable grass, often resembling and sometimes mistaken for *Hordeum jubatum*, but readily distinguishable by its divided bracts.

45. **ASPERELLA** Humb. BOTTLE-BRUSH-GRASS.

Leaf-blades broad, flat. Spike racemose, the spikelets resembling short, fascicled branchlets owing to the exposure of the base of the rachilla by the suppression of the bracts; spike at first cylindrical, in æstivation loose. Spikelets 1 to 5 at each node of the more or less flattened and notched rachis, 1 to 4-flowered. Bracts reduced to scars, or small, deciduous spines. Rachilla jointed below each bractlet, terminating in a perfect or staminate flower. Bractlet coriaceous, rounded on the back, 5-nerved above, terminating in a long, stout awn. Palea 2-keeled. Scales 2, large, distinct, shortly and unequally toothed above, acute, ciliate. Stamens 3; anthers large. Ovary hairy, especially above; stigmas 2 lines long, sessile or nearly so, remote, feathery. Achene hairy at the apex. (Diminutive of Latin *asper*, rough, prickly, referring to the rough, long-awned spike of some species.)

1. *A. Californica* (Boland.) Beal. CALIFORNIA BOTTLE-BRUSH. Rootstock perennial, stout, creeping; stems stout, leafy, sub-solitary, erect from a decumbent base, $3\frac{1}{2}$ to 6 ft. high; sheaths split to the base, loose, scabrous, those below usually clothed with short, stiff, spreading or reflexed hairs; ligule about 1 line long, obtuse, erose, brown; blade 4 to 14 in. long, $\frac{1}{2}$ to 1 in. wide, flat, antrorsely scabrous, especially beneath, shining with a satiny luster; spike 5 to 10 in. long, dense and drooping above, interrupted below, purplish; rachis with scabrous margins; spikelets $\frac{1}{2}$ to $\frac{3}{4}$ in. long, 1 to 3-flowered;

rachilla with a prominent callus below each bractlet; bractlet 6 to 7 lines long, 5-nerved, the nerves, especially the marginal ones, ciliate-hispid with short, stiff, rather distant, white hairs; awn stout, straight, rough, about 10 lines long; palea membranaceous, prominently keeled, ciliate above; scales $1\frac{1}{2}$ lines long, ciliate fringed; anthers 3 lines long, yellow.—(*Gymnostichum californicum* Boland.; *Asprella californica* Benth.)

Apparently confined to moist woodlands and thickets in the redwood belt immediately north and south of San Francisco: San Gregorio redwoods, San Mateo Co., *Kellogg* and *Brannan*; Sausalito; Santa Cruz Co.; Taylorsville; Olema; Inverness. Apr.—July. In the young state the plant closely resembles an *Elymus*, and entirely lacks the “bottle-brush” aspect of its mature state; it can always be distinguished, however, by the short, pedicel-like rachilla-base of the spikelets, and the absence of bracts.

46. HORDEUM L. BARLEY-GRASS.

Leaf-blades flat. Inflorescence a dense spike, jointed at the nodes and breaking up at maturity, the spikelets remaining attached to the hard, sharp, callus-like internode. Spikelets 1-flowered, in threes at each joint of the rachis; the central sessile, perfect; the lateral, in ours, pedicellate and usually sterile. Bracts often reduced to awns and resembling an involucre around the spikelets, rigid. Rachilla prolonged beyond the flower as a bristle. Bractlets chartaceous in age, rounded on the back, 5-nerved at the apex, that of the perfect spikelet, and sometimes all, awned. Palea scarcely shorter than its bractlet, 2-keeled. Stamens 3. Styles very short, distinct. Achene hairy at the summit. (*Hordeum* the Latin name for Barley, the typical plant of the genus.)

Perennial; spike slender; awns appressed; bracts of all the spikelets bristle-like; bractlet of the central spikelet 3 to 4 lines long 1. *H. nodosum*.
Annuals; spike stout, broad; awns rigid, erect or spreading; bracts not all bristle-like.

Bracts of the central spikelet strongly pectinate-ciliate; spike 2 to 4 in. long.

2. *H. murinum*.

Bracts of the central spikelet not pectinate-ciliate; spike 1 to 2 in. long.

3. *H. maritimum*.

1. *H. nodosum* L. MEADOW BARLEY-GRASS. Erect perennial; stems $\frac{1}{2}$ to 3 ft. high; sheaths glabrous, often glaucous; ligule truncate, $\frac{1}{4}$ to $\frac{1}{2}$ line long; blades $2\frac{1}{2}$ to 4 lines wide, often deflexed, flat, scabrous, or scabrid above only; spike $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long, slender, 4 to 5 lines wide, compressed, usually nodding; awns appressed, brown, tinting the whole spike; rachis very brittle; lateral spikelets awnless, staminate or rudimentary, $2\frac{1}{2}$ lines long, or reduced to an empty bractlet; bracts all awnlike, scabrous; bractlet of central spikelet awned, 7 to 9 lines long including the awn; scales 2, ovate, obtuse, hyaline, ciliate above, $\frac{1}{2}$ line long; anthers yellow, $\frac{1}{2}$ line long.—(*H. pratense* Huds.)

Common by roadsides, in waste places and borders of fields, often occurring in alkali soils. Common in Alameda, Contra Costa, San

Francisco, Marin, and Santa Cruz Cos. Mch.-May, or sometimes even as early as December.

2. *H. murinum* L. BARLEY-GRASS. Annual; stems 6 to 24 in. high, decumbent at base, or in moist, shady places erect; upper sheaths glabrous, light green, scarious-margined, often inflated; lower pilose; ligule $\frac{1}{2}$ to $\frac{3}{4}$ line long, truncate; blade both softly pubescent and scabrous, 1 to $5\frac{1}{2}$ lines wide; spikes 2 to 4 in. long, broad, stout, compressed; awns erect; spikelets densely imbricate; bracts awned; those of the central spikelet lanceolate, flat, 3-nerved, ciliate, with awns 9 to 12 lines long; those of the lateral spikelets similar, excepting the inner which are awn-like and not ciliate; bractlet scabrous at the apex, about 6 lines long, its awn $\frac{2}{3}$ to 2 in. long; bractlets of the lateral spikelets somewhat smaller, awn $\frac{1}{2}$ to 2 in. long; palea emarginate, somewhat webby within, keels distantly ciliate; scales of the sterile spikelets very prominent, $1\frac{1}{2}$ lines long; anthers broad, $\frac{1}{2}$ line long, green.

Native of Europe; naturalized and now very common throughout middle and southern California, and spreading northward: Spring Valley, San Francisco, 1862, *Bolander*; Antioch; Berkeley; etc. Apr.-May. Often miscalled Fox-tail.

3. *H. maritimum* With. SEASIDE BARLEY-GRASS. A slender glaucous annual of salt-marshes and alkali soils; inner bracts of the lateral spikelets obliquely lanceolate, $\frac{1}{2}$ line wide.

Reported as occurring along the coast of Washington, Oregon, and California, but perhaps confused with var. *Gussonianum*.

Var. *Gussonianum* HUSN. (*H. Gussonianum* Parl.) GUSSONI'S BARLEY-GRASS. Slender annual, 4 to 12 in. high; spike 1 to $1\frac{1}{2}$ in. long, excluding the awns; lateral spikelets reduced to rudiments; flower of central spikelet sessile; bracts of the central spikelet setaceous, the inner one of the lateral spikelets slightly flattened, $\frac{1}{4}$ line wide, not at all ciliate.—Naturalized from S. Europe and now very common throughout the State: Berkeley; Olema; Bodega Point, and elsewhere. Apr.-May.

4. CYPERACEÆ. SEDGE FAMILY.

Annual or perennial herbs of marshy or damp places. Stems solid, arising from rootstocks, triangular or terete, the upper internode below the inflorescence generally very long. Leaves often arranged in 3 rows, sheathing at base, the sheath closed, seldom split; ligule none or very small. Flowers in spikelets, solitary and sessile in the axils of imbricated glume-like bractlets, and disposed in 2 or more ranks; spikelets solitary or clustered, or arranged in spikes, racemes, panicles or umbels, and subtended by leafy bracts, or naked. Perianth none or represented by usually 4 to 6 bristles. Stamens 3. Pistil 1; ovary 1-celled, the single style 2 or 3-cleft. Fruit a lenticular or more or less triangular achene. (The specific keys and descriptions in this family have been done by Mr. J. Burt Davy.)

Flowers perfect (the stamens and pistils in the axil of the same bractlet).

Spikelets flattened, the bractlets arranged in 2 opposite rows

1. CYPERUS.

Spikelets cylindrical, the bractlets arranged around the axis in several rows.

Style enlarged at base,

Forming a persistent tubercle jointed on the apex of the achene; spikelet solitary, terminal upon a leafless bractless scape

2. ELEOCHARIS.

Wholly deciduous at maturity; spikelets in an involucre umbel

3. FIMBRISTYLIS.

Style not enlarged at base, deciduous or only the base persistent

Stamens mostly 3; spikelets solitary or clustered or in a compound umbel

4. SCIRPUS.

Stamens 1 to 3; bristles (perianth-hairs) numerous, long exserted and silky in fruit

5. ERIOPHORUM.

Flowers monœcious or diœcious, usually in separate spikelets; pistil and achene enclosed in an inflated sac-like bractlet (perigynium)

6. CAREX.

1. CYPERUS L. GALINGALE.

Annuals or perennials. Stems triangular, leafy at the base, the inflorescence subtended by 1 or more conspicuous, leafy bracts. Spikelets solitary or clustered on the unequal rays of an umbel with the central spikelet or cluster always sessile, or the whole contracted into a dense head. Bractlets concave and more or less carinate, arranged in 2 ranks in a flattened spikelet. Bristles in the flower none. (Kyperos, an old Greek name applied by Herodotus to an aromatic plant used by the Scythians for embalming.)

Style 2-cleft; achene lenticular; rachilla narrow, not winged . 1. *C. diandrus*
var. *castaneus*.

Style 3-cleft; achene triangular.

Rachilla not winged, naked or nearly so.

Stems $\frac{1}{2}$ to 6 in. high 2. *C. aristatus*.

Stems over 12 in. high 3. *C. serrulatus*.

Rachilla clothed with the persistent, decurrent wings of the bractlets.

4. *C. erythrorhizos*.

1. *C. diandrus* Torr. var. *castaneus* Torr. Described as an annual with stems $\frac{1}{2}$ to 2 ft. high, slender, triangular; leaves elongate, 1 line or less wide; involucre bracts 2 to 3, foliaceous; spikelets linear-oblong, acute, 3 to 6 lines long; rachilla not winged; bractlets brown, 1 to $1\frac{1}{4}$ lines long; stamens 2 to 3; style 2-cleft to the middle; achene lenticular.

"Swamps near San Francisco, Bolander, and in the valley of the Sacramento, Pickering."

2. *C. aristatus* Rottb. Annual; stems $\frac{1}{2}$ to 6 in. high, barely exceeding the leaves; leaves $\frac{1}{2}$ line or less wide; involucre bracts foliaceous, $\frac{1}{2}$ to 2 in. long; rays few, $\frac{1}{2}$ to 1 in. long; spikelets sessile, densely clustered, $1\frac{1}{2}$ to 3 lines long, flattened; rachilla not winged; bractlets with strongly recurved setaceous tips, striate, chestnut-brown or greenish, 1 line long; style 3-cleft; achene triangular.

Chico, Greene; Jackson, Hansen; perhaps not occurring within our limits. June.

3. *C. serrulatus* Wats. Perennial(?); stems $1\frac{1}{2}$ ft. or more high, stout, triangular; involucre bracts 6 to 8, foliaceous, 3 to 18 in. long, 2 to $3\frac{1}{2}$ lines wide, flat (or conduplicate?); inflorescence irregularly umbellate, with unequal rays; spikelets numerous, in dense umbels,

many-flowered, lanceolate, flattened, 4 to 8 lines long; rachilla not winged, naked, or nearly so; bractlet 1 line long, amplexicaul, broadly ovate, acute, 3-nerved, keeled, not winged at the base; keel serrulate on the back at the apex; stamen 1; style 3-cleft; achene triangular.

Healdsburg, Sept., 1896, Miss Alice King.

4. **C. erythrorhizos** Muhl. Annual; stems 1 to $1\frac{1}{2}$ ft. high, stout, triangular; leaves flat or conduplicate, 6 to 14 in. long, 2 to 3 lines wide; involucre bracts 6 to 8, foliaceous, 4 to 12 in. long; rays $1\frac{1}{2}$ in. long or less, bearing umbels of spikes which are $\frac{1}{2}$ to 1 in. long; bracts of involucre shorter, foliaceous; spikelets usually 2 to 3 lines long, narrowly linear, somewhat crowded, horizontally spreading, nearly flat, bright chestnut-color; rachilla clothed with the persistent wings of the bractlets; bractlet $1\frac{1}{2}$ lines long, oblong, obtuse, mucronulate; keel smooth; style 3-cleft; achene triangular.

Along the Lower Sacramento, Solano Co., Jepson; Visalia, Congdon.

2. ELEOCHARIS R.Br. SPIKE-RUSH.

Annuals or perennials. Stems simple, terminating in a solitary spikelet not subtended by an involucre. Leaves reduced to sheaths or the lowest rarely blade-bearing; spikelets several to many-flowered. Bractlets concave, imbricated all around. Stamens 2 to 3. Bristles 3 to 9, commonly retrorsely barbed. Style usually 3-cleft and achene 3-angled, or 2-cleft and achene lenticular; base of the style enlarged and persistent as a tubercle on the summit of the achene. (Greek eleo-, marsh, charis, delight.)

Stems setaceous; spikelet 1 to 3 lines long; style 3-cleft; achene obscurely triangular or almost obovoid.

Stems stoutish; spikelet 3 to 12 lines long; style 2-cleft; achene plano-convex.

1. *E. acicularis*.
2. *E. palustris*.

1. **E. acicularis** R. Br. SLENDER SPIKE-RUSH. Rootstock very slender, creeping; stems 1 to 8 in. high, very slender; spikelet 1 to 3 lines long, few-flowered; bractlets ovate-oblong, $1\frac{1}{2}$ lines long, reddish-brown with broad green mid-vein; style deeply 3-cleft; achene $\frac{1}{2}$ line long, obscurely triangular, ribbed on the sides; tubercle broad, short and blunt.

Moist places: Mountain Lake, San Francisco. Aug.

2. **E. palustris** R. Br. COMMON SPIKE-RUSH. Perennial; rootstock stout, creeping, stoloniferous; stems $\frac{1}{2}$ to 2 ft. high, slender, mostly terete, sheathed at the base, leafless; sheaths sub-truncate; spikelet many-flowered, 6 to 12 lines long, oblong-lanceolate to linear, brown with broad whitish margin and greenish keel; style 2-cleft; achene plano-convex, rounded but not at all angled on the back, 1 line long including the tubercle, which is constricted at the point of junction.

Common in marshes and shallow, slow-moving creeks: Glen Ellen, Sonoma Co., Bioletti; Point Lobos, San Francisco; Lake San Andreas, San Mateo Co.; Stege. May-June.

3. **FIMBRISTYLIS** Vahl.

Annuals or perennials. Stems leafy below. Spikelets umbellate or capitate, terete, subtended by a 1 to many-leaved involucre. Stamens 1 to 3. Bristles none. Style 2 to 3-cleft, its base much swollen, the whole falling away from the achene at maturity. Achene lenticular or triangular. (Latin fimbri, thread-like, stylus, style.)

Spikelets umbellate, solitary 1. *F. miliacea*.
Spikelets clustered 2. *F. apus*.

1. *F. miliacea* Vahl. Annual(?); umbel diffusely compound; spikelets sub-globose, about 1 line long; style 3-cleft; achene acutely triangular, muricate-tuberculate.

Reported as introduced at San Francisco.

2. *F. apus* (Gray) Wats. Annual; spikelets in nearly sessile clusters, lanceolate, 2 lines long; style 2-cleft; achene lenticular, obovate, faintly tuberculate.

Clear Lake, *Bolander*.

4. **SCIRPUS** L. CLUB-RUSH. BULRUSH.

Annuals or perennials. Stems leafy or the leaves reduced to mere sheaths at base. Spikelets terete or somewhat flattened, solitary or in heads spikes or umbels, subtended by an involucre of 1 to several leaves or the involucre obsolete. Bristles 3 to 6, barbed, ciliate, or obsolete. Stamens 2 to 3. Style 2 to 3-cleft, not swollen at the base, deciduous or its base persistent on the achene. Achene triangular, lenticular or obovoid. (Latin scirpus, bulrush.)

Stems low and slender; inflorescence terminal; spikelet mostly solitary; bristles obsolete.—Sub-genus *ISOLEPIS* Benth.

Stems 2 to 6 in. high; bractlets obtuse or mucronate; involucreal bract 1 to 3 lines long 1. *S. riparius*.

Stems 1 to 3 in. high; bractlets acute, shortly beaked, strongly keeled; involucreal bract 5 to 9 lines long 2. *S. carinatus*.

Stems tall and stout; spikelets in clusters, umbels or panicles; bristles retrorsely barbed or ciliate or rarely obsolete.—Sub-genus *EU-SCIRPUS* Benth.

Inflorescence apparently lateral; involucre of a single erect bract.

Stem terete or nearly so, leafless or nearly so; spikelets umbellate

3. *S. lacustris*
var. *occidentalis*.

Stem triquetrous or wing-angled, leafless or with a single short leaf at base; involucreal bract 1 in. or less long; spikelets densely clustered.

4. *S. Olneyi*.

Stem triangular, somewhat leafy; involucreal bract 1 to 4 in. long; spikelets densely clustered 5. *S. Americanus*.

Inflorescence terminal; involucre of several spreading, foliaceous bracts.

Spikelets 5 to 8 lines long, few, sparingly umbellate or in a sessile cluster, dark brown 6. *S. robustus*.

Spikelets 1½ to 2 lines long, numerous, in a compound or decumbent panicle, greenish or lead-colored 7. *S. microcarpus*.

1. *S. riparius* Spreng. SLENDER CLUB-RUSH. Annual; stems tufted, very slender, 2 to 6 in. high, sheathed at base; upper sheath often bearing a short slender leaf; involucreal bract 1 to 3 lines long; spikelet solitary, oblong-ovate, 1½ to 2½ lines long, mostly less than

1 line wide; bractlets obtuse or mucronate; bristles obsolete; achene less than $\frac{1}{2}$ line long, trigonous-obovoid with distinct angles, apiculate, not striate nor ribbed, dark brown when mature.

Not uncommon in springy places: Point Lobos, *Greene, Dary*; bluffs near Lake Merced, *Greene*; near Olema, *Davy*. June-Aug.

2. **S. carinatus** Gray. DWARF CLUB-RUSH. Annual; stems slender, triangular, 1 to 4 in. high, with a short leaf at base; involucre bract 5 to 6 lines long; spikelet solitary, ovate, 2 to 3 lines long, mostly $1\frac{1}{2}$ lines wide; bractlet acute, shortly beaked, strongly keeled; bristles obsolete.

Reported as abundant in swamps about San Francisco, *Bolander*; Santa Rosa Creek, *Bigelow*.

3. **S. lacustris** L. var. **occidentalis** Wats. TULE. Perennial; rootstock stout, creeping; stems 3 to 9 ft. high, terete or very obtusely trigonous above, leafless or with a short terete leaf from the upper basal sheath; inflorescence apparently lateral, umbellate, 4 to 5 in. long; involucre bract stout, shorter than the inflorescence; spikelets 3 lines long, numerous, in an irregularly compressed umbel; rays unequal; bristles 4 to 6, slender, retrorsely barbellate, not exerted; style 2-fid; achene gray, abruptly mucronate.

Common in brackish and fresh-water marshes throughout the State: Lake Merced; Martinez; Suisun Marshes, etc. The closely allied species *S. Californicus* (C. A. Mey.) Britt., (*S. Tatora* Kunth), having the bristles shortly plumose below and with a nearly white achene, narrowed above, should be looked for.

4. **S. Olneyi** Gray. OLNEY'S BULRUSH. Perennial; stems 2 to 5 or more ft. high, stout, triquetrous, continued as an entire involucre about 1 in. or less beyond the inflorescence, sheathed at base, leafless or with a single short, triquetrous leaf; inflorescence apparently lateral; spikelets 2 to many in a crowded sessile cluster, oblong-ovate, about 2 lines long; bractlets brown.

Common in brackish marshes from Suisun Bay southward: Newark; Suisun Marshes; reported also from San Francisco. May.

5. **S. Americanus** Pers. THREE SQUARE. Perennial; stem 1 to 2 ft. high, slender, triangular, somewhat leafy, continued as an entire, triangular, pungent involucre 1 to 4 in. beyond the inflorescence; leaves short; inflorescence apparently lateral; spikelets 1 to 6, in a crowded, sessile cluster, oblong-ovate, 3 to 4 lines long; bractlets dark brown, usually conspicuously tipped with a stout, pale-colored awn about a line long.—(*S. pungens* Vahl.)

Marshy places, often brackish: Point Lobos, San Francisco, southward and eastward.

6. **S. robustus** Pursh. SALT-MARSH BULRUSH. Perennial; rootstock stout, often forming hard woody tubers; stems 1 to 3 ft. high, stout, trigonous; leaves equaling or exceeding the stem, keeled, flat or deeply channeled, 2 to 4 lines wide, antrorsely scabrid on the margins and keel; involucre of several unequal spreading foliaceous bracts 1 to 8 in. long, one much the longer and more erect; inflores-

cence terminal, of few to many sparingly umbellate spikelets; spikelets oblong-ovate, acute, 6 to 8 lines long, 4 to 5 lines broad at base, chestnut-colored or dark brown; bractlets thinly scarious, strongly keeled, bifid, with a short soon recurved awn from between the teeth; achene broadly obovate, plano-convex or with a low ridge on the back, obtuse and slightly apiculate, dark brown, shining.—(*S. maritimus* of Bot. Cal.)

Common in brackish marshes along the coast, and in moist alkaline soils in the interior: Newark; Suisun Marshes; Fl. May. Fr. Sept.

Var. **compactus** Davy, var. nov., has the spikelets congested into dense heads:—Stege.

7. **S. microcarpus** Presl. PANICLED BULRUSH. Perennial; rootstock stout, creeping; stem 2 to 3 ft. high, stout, leafy, triangular; leaves flat, 6 to 12 lines wide; margins scabrid; involucre of several sub-equal spreading foliaceous bracts, about equaling the inflorescence; panicle decompound, large and open; rays 1 to 6 in. long, the spikelets in terminal and axillary clusters; spikelets $1\frac{1}{2}$ to 2 lines long, oblong-ovate, greenish or lead-colored; bristles 4, barbed to the base; stamens 2; style bifid; achene $\frac{1}{2}$ line long, pale, plano-convex, not angled on the back, abruptly short-beaked.—(*S. sylvaticus* L. var. *digynus* of Bot. Cal.)

Common along streams and in fresh-water marshes: Berkeley; San Francisco; Lake Pilarcitos, San Mateo Co.; Mt. Tamalpais; Guerneville. May–Oct.

5. **ERIOPHORUM** L. COTTON-SEDGE.

Bog perennials. Stems from creeping rootstocks, triangular or subterete, leafy or naked. Leaves linear or the uppermost reduced to sheaths. Spikelets terminal on the stem, solitary or clustered or umbellate, subtended by an involucre of scale-like bracts or none. Bractlets of the spikelet membranaceous. Bristles numerous, filiform, silky, becoming greatly elongated in fruit. Stamens 1 to 3. Style very slender and elongated, 3-cleft. Achene triangular. (Greek *erion*, wool, *phora*, crop, referring to the woolly heads.)

1. **E. gracile** Koch. SLENDER COTTON-SEDGE. Described by Watson as having stems 1 to 2 ft. high, very slender, with one or more erect, very narrow, triangular leaves; involucre of 2 to 3 erect, brownish, ovate-lanceolate bracts, the lowest being sometimes partially foliaceous; rays $\frac{1}{2}$ in. or less long, slightly nodding, tomentose-scabrous; spikelets 2 to 5, oblong, 3 to 4 lines long; bractlets ovate, obtuse, slate-colored or brownish; achene $1\frac{1}{3}$ lines long, linear-oblong, broadest above.

Reported as occurring in "swamps near Santa Rosa, Sonoma Co., Bigelow."

6. **CAREX** L. SEDGE.

Perennial. Stems from rootstocks, triangular and commonly more or less scabrous on the angles, the leaves in 3 ranks. Spikelets terminal and solitary, or with several below the terminal one in the axils

of leafy or scale-like bracts, either wholly pistillate and wholly staminate or with both pistillate and staminate flowers which are occasionally dioecious. Flowers in the axils of scale-like bractlets. Staminate flower of 3 stamens. Pistillate flower consisting of a single pistil; ovary enclosed in an inflated bract or sac (perigynium) contracted at the top through which project the 2 or 3 stigmas. Achene triangular, lenticular or plano-convex, completely enclosed in the perigynium. (Latin name used by Virgil for the sedge. The key to our species of this critical and difficult genus has been adapted from Prof. L. H. Bailey's "Preliminary Synopsis of North American Carices." For the briefly described vegetative characters we have drawn largely from Boott's account of the Californian species, in the absence of sufficient material; it is a matter for regret that so few specimens of this interesting genus are brought in by local collectors.)

Spikelets unisexual or rarely androgynous; staminate flowers forming 1 or more terminal linear or club-shaped spikelets, which are occasionally sparingly androgynous; pistillate flowers usually in distinct and simple mostly pedicellate spikelets; cross-section of the perigynium circular, obtusely angled or prominently trigonous in outline; style mostly 3-parted; achene mostly trigonous or triquetrous.—Sub-genus EU-CAREX Coss.

Perigynium large, tapering into a beak as long as or longer than the body, papery in texture, more or less inflated, smooth, nerved, straw-colored or occasionally purple at maturity; spikelets few to many, distinct, compactly flowered; stigmas 3.

Perigynium much inflated, usually prominently few-nerved, beaked, conspicuously short-toothed; staminate spikelets commonly 2 or more; pistillate usually long and densely cylindrical; plants mostly large and stout 1. *C. vesicaria*.

Perigynium less inflated, more conspicuously nerved or even costate; teeth more or less setaceous or aristate; bractlet usually aristate; spikelets mostly nodding, comose in appearance 2. *C. Pseudo-cyperus* var. *comosa*.

Perigynium small, nearly or entirely beakless and mostly entire mouthed, thinner in texture; mostly paludose species with colored spikelets; often growing in dense tufts or tussocks.

Spikelets short and erect, very closely flowered, the terminal strictly staminate; bracts with purple or black auricles at base; stigmas 2 or 3; mostly stiff and rigid species.

Stigmas 3 3. *C. bifida*.

Stigmas 2 4. *C. nudata*.

Spikelets long and large, green or light-colored; stigmas 2; species larger, distinguished mainly by habit; mostly paludose.

Stems clothed with dead sheaths below; spikelets mostly long pedicellate. 5. *C. obnupta*.

Stems spongy at base; spikelets mostly sessile 6. *C. aquatilis*.

Spikelets large, cernuous or drooping, mostly dark-colored; stigmas 2; bractlets very long and conspicuous; plants large. 7. *C. Sitchensis*.

Perigynium mostly short and rounded; beak straight and usually 2-fid, firm or hard in texture, not inflated, hairy or scabrous; staminate spikelet 1; pistillate spikelets 1 in. or less long, usually globular or short-oblong, more or less sessile and approximate, or the longer ones radical; bracts sheathless, short or obsolete; stigmas rarely 2; low species of dry ground, with leaves all radical.

Spikelets 2 to several, the lowest occasionally long-pedicellate and radical; perigynium abruptly rounded above, contracted above and below, bearing a more or less prominent rib on each side. 8. *C. globosa*.

Spikelets androgynous (rarely dioecious or some of the spikelets unisexual); staminate flowers usually borne at the base or apex of the pistillate spikelets, rarely the staminate and pistillate flowers irregularly situated; pistillate flowers mostly in short and sessile spikelets (in some cases the spikelets

single) which are commonly aggregated into heads or even panicles; cross-section of the perigynium plano-convex in outline; styles 2; achene lenticular; the spikelets, especially the uppermost, usually have contracted bases when the staminate flowers are borne below the pistillate ones, and empty scales at the top when the staminate flowers are borne above.—Sub-genus VIGNEÆ Koch.

Flowers often diceious or nearly so, or the staminate and pistillate flowers irregularly situated, or some of the spikelets occasionally wholly staminate or pistillate.

Inflorescence a simple or nearly simple head; perigynium ovate, stipitate, concealed by the bractlet, at length nearly black. 9. *C. marcidæ*.

Flowers monœcious; spikelets regularly androgynous, the staminate flowers uniformly borne at the top.

Spikelets yellow or tawny when mature, short, rarely longer than broad; perigynium mostly small and short and nearly nerveless, or in some species becoming nearly lanceolate and more or less prominently nerved, firm in texture.

Inflorescence a simple or nearly simple head . . . 10. *C. Brongniartii*.

Spikelets green or nearly so when mature, aggregated or scattered, never in compound heads; perigynium mostly short-ovate, in most cases not conspicuously nerved.

Plants slender; spikelets more or less scattered . . . 11. *C. muricata*

var. *gracilis*.

Flowers monœcious; spikelets regularly androgynous, the staminate flowers uniformly borne at the base.

Inflorescence silvery green or sometimes tawny when mature; spikelets mostly small, distinct; perigynium not wing-margined nor conspicuously broadened, mostly nearly flat on the inner surface.

Perigynium ovate, sharp-margined, firm, often thickened at the base, spreading, in open, and at maturity stellate, spikelets

12. *C. echinata*.

Perigynium ovate-lanceolate or nearly linear, mostly in loose spikelets . .

13. *C. Deweyana*.

Inflorescence tawny or dark; spikelets rather large, sometimes crowded; perigynium with a more or less thin or winged margin, which is incurved at maturity, rendering the perigynium concave on the inner surface.

Perigynium ovate or ovate-orbicular, thickened in the middle

14. *C. festiva*.

1. *C. vesicaria* L. Rootstock creeping; stems 1 to 3½ ft. high, sharply angled, scabrous; leaves 2 to 3 lines wide, the upper exceeding the stem; bracts exceeding the stem; perigynium conspicuously turgid, ovoid or conical, ascending at maturity, smooth, shining.

Tomales Bay, *Bolander*, no. 2303, teste Boott.

2. *C. Pseudo-cyperus* L. var. *comosa* Boott. Stems 1½ to 2½ ft. high, stout, sharply angled; leaves rigid, tapering to a long slender triangular apex, 2½ to 5 lines wide; spikelets densely flowered, uppermost staminate; perigynia retrorsely spreading in fruit; beak very long, deeply bifid.

Swamps near San Francisco, *Bolander*, no. 2301, teste Boott; over-flow marshes of flats along Russian River, near Guerneville, *Davy*.

3. *C. bifida* Boott. Stems 2 to 3 ft. high, slender, acutely angled; leaves 1 to 2 lines wide, pale, mostly shorter than the stem; lower sheaths reddish, sparingly reticulate-fibrous; spikelets 4 to 9 lines long, 3 lines wide, densely-flowered, purple and glaucous, the terminal rarely bearing a few pistillate flowers above; perigynium shortly beaked.

Coast Ranges: in rather dry soil, Salinas Valley, *Brewer*, no. 574; Pacheco Pass, Santa Clara Co., *Bolander*, no. 4837, teste Boott.

4. **C. nudata** Boott. Stems sharply angled, scabrous, 12 to 16 in. high, slender, clothed at base with conspicuous dark brown leafless reticulate-fibrous sheaths; leaves 1 to $2\frac{1}{2}$ lines wide, setaceously pointed, shorter than the stem; bracts without sheaths, lowest rarely equaling the stem; auricles purple, oblong; perigynium purple above, straw-colored below, deciduous.

Coast Ranges from San Francisco to Ukiah: Marin Co., in a creek, no. 2299; Sonoma Co., no. 3836; Mill Creek, Ukiah, no. 4638; Oakland Slough, no. 6202; all *Bolander*, teste Boott. Apr.

5. **C. obnupta** Bailey. Rootstock creeping, stoloniferous; stems 2 to 4 ft. high, forming large, dense clumps, clothed with dead sheaths below; leaves almost equaling the stems, 2 to 3 lines wide; margins scabrous; bracts much exceeding the stem.

Common in moist cañons and on the borders of streams and swamps in the Coast Ranges: type localities "San Mateo Co., *Kellogg*; Sierra Nevada (Donner), *Kellogg* and *Brannan*; Fort Point, San Francisco, *Bolander*;" Olema; Lorin, *Davy*.

6. **C. aquatilis** Wahl. Rootstock stoloniferous; stems 2 to 3 ft. high, stout, obtusely angled, smooth, spongy at base; leaves pale, $1\frac{1}{2}$ to 3 lines wide, often exceeding the stem; bracts foliaceous, clasping, without sheaths, lower much exceeding the stem.

Santa Clara Valley, 12 miles from San Jose, *Bolander*, teste Boott.

7. **C. Sitchensis** Presc. Stems 2 to 5 ft. high, stout, sharply angled, scabrous, many-leaved at base; lower sheaths reticulate-fibrous; leaves 3 to 4 lines wide, rigid, the cauline shorter, the radical longer than the stem; bracts without sheaths, foliaceous, the lower far exceeding the stem; auricles purple, clasping.

Salt-marshes about San Francisco Bay, *Bolander*, and northward along the coast, teste Boott.

8. **C. globosa** Boott. Rootstock stoloniferous; stems 4 to 16 in. high, very slender, scabrous, clothed at base with reddish-purple sheaths that break up into thread-like fibers; leaves firm, 1 to 2 lines wide, the lower longer than the stem; lower bracts short-sheathed, longer than their spikelets.

Coast Ranges among redwoods: highest point of Oakland Hills, *Bolander*, no. 2298, teste Boott.

9. **C. marcida** Boott. Stems 1 to $2\frac{1}{2}$ ft. high, slender, scabrous; leaves 1 line-wide, shorter than the stem; flowers often more or less diœcious.

On the Lower Sacramento, *Pickering*; Santa Clara Marshes, *Peckham*, teste Boott; Point Isabel, *Davy*. Apr.

10. **C. Brongniartii** Kunth. Rootstock creeping; stems 10 to 30 in. high, firm, slightly scabrous above; leaves shorter than the stem, 1 to $2\frac{1}{2}$ lines wide; bracts setaceous, exceeding the spikelets, the lowest sometimes exceeding the stem.—(*C. glomerata* of Bot. Cal.)

From about San Francisco Bay, *Bigelow*, *Bolander*, to Mendocino City, *Bolander*, teste Bailey. Var. **DENSA** Bailey (*C. paniculata* of Bot. Cal.), described as "densely cæspitose" and as having denser

heads, mostly thickest at the base, often nearly an inch in width.—Salt-marshes near San Francisco, *Bolander*, no. 1568 in part, teste Bailey.

11. *C. muricata* L. var *gracilis* Boott. Rootstock creeping, clothed with imbricated strongly nerved purple scales; stems $\frac{3}{4}$ to 2 ft. high, very slender, sharply angled, scabrous; leaves shorter than the stem, 1 line wide, tapering to a very slender, setaceous summit; bracts ovate, awned, commonly exceeding the spikelets, the lowest setaceous and often an inch or two long.

Near the coast, from about San Francisco Bay, *Bigelow*, *Bolander*, to Fort Bragg, *Bolander*, no. 4765, teste Boott.

12. *C. echinata* Murr. Cæspitose; stems $\frac{1}{2}$ to 2 ft. high, few-leaved, stiff; leaves flat and grass-like, $\frac{1}{2}$ to 1 line wide, much shorter than the stem; lower bract subulate from a lanceolate base, longer or shorter than its spikelet.

Coast Ranges, *Bolander*; swamps near Santa Rosa, *Bigelow*, teste Boott. Apr.—May.

13. *C. Deweyana* Schwein. Cæspitose; stems $\frac{1}{2}$ to 4 ft. high, sharply angled, scabrous, slender, weak and often decumbent; leaves flaccid, 1 to 2 lines wide, shorter than the stem; lowest bract setaceous, seldom exceeding the stem, upper shorter or scale-like.

Shady hillsides, Napa Valley, *Thurber*, *Bigelow*, teste Boott. Var. *BOLANDERI* Boott. with a slender stem and broader leaves is reported from Oakland, *Bolander*, teste Boott.

14. *C. festiva* Dewey. Cæspitose; stems $\frac{1}{2}$ to 2 ft. high, sharply angled; leaves 3 to 5, the upper the longest, commonly shorter than the stem, 2 to 2 $\frac{1}{2}$ lines wide.

Coast Ranges, in woods among grass, the stems sometimes rooting; from Monterey, *Brewer*, no. 697, to Ukiah, *Bolander*, teste Boott.

5. JUNCACEÆ. RUSH FAMILY.

Annual or perennial herbs. Stems simple, terete or ancipital, hollow or spongy. Leaves alternate, sheathing, narrow, flat or terete. Flowers lily-like in structure, sedge-like in aspect, small, dry, perfect, disposed in terminal or apparently lateral heads, spikes, sub-umbellate clusters or panicles. Perianth consisting of 6 distinct similar glume-like segments. Stamens 6 or sometimes 3. Ovary superior, 3 or sometimes 1-celled; stigmas 3, filiform; ovules 3 to many. Fruit a loculicidally 3-valved capsule. Embryo minute, enclosed in fleshy endosperm. In both the genera *Luzula* and *Juncus*, individuals of the same species vary greatly in aspect owing to the tendency of the inflorescence to become either capitately-congested on the one hand or loosely paniculate on the other. (The specific keys and descriptions in this family have been done by Mr. J. Byrtt Davy.)

Leaves stiff, terete or flat; stems usually with spongy pith; capsule 3 or 1-celled; seeds several to many 1. JUNCUS.
Leaves soft, flat; stems hollow; capsule 1-celled; seeds 3 2. LUZULA.

1. **JUNCUS** L. RUSH.

Plants of swamps or wet places; herbage glabrous. Stems usually with spongy pith. Leaves stiff, terete, channeled or flat. Flowers paniced, corymbose or in dense clusters, greenish or brownish. Capsule 3-celled with central placenta or 1-celled with 3 parietal placenta, many-seeded. For detecting the markings on the seeds of most of the *Junci*, a $\frac{2}{3}$ or $\frac{1}{2}$ in. objective is necessary. (Classic name for the rush, perhaps from Latin *jungo*, to join, the stems used for binding.)

Annuals; roots fibrous.

Leaves cauline; stems branched; flowers cymosely arranged in twos or threes and second; testa finely striate and cross-lined. 1. *J. bufonius*.

Leaves radical; stems scapiform; flowers solitary, terminal; testa reticulate. 2. *J. uncialis*.

Perennials; rhizomes mostly stout and creeping.

Leaves terete or wanting; panicle lateral, sessile.

Stamens 6.

Perianth $2\frac{1}{2}$ to 3 lines long; anthers 1 line long; capsule oblong-ovate, acute 3. *J. Leseurii*.

Perianth $1\frac{1}{2}$ lines long; anthers $\frac{1}{2}$ line long; capsule sub-globose, slightly angled, obtuse, apiculate 4. *J. patens*.

Stamens 3.

Perianth 1 line long; anthers $\frac{1}{2}$ line long; capsule clavate-obovate, obtuse or retuse 5. *J. effusus*.

Leaves flat, channeled; panicle terminal.

Stems terete; leaves not equitant nor transversely ribbed.

Rootstocks tufted; stems naked above, leafy at base; leaves less than $\frac{1}{2}$ line wide; flowers solitary in a diffuse or rarely compact panicle 6. *J. tenuis*.

Rootstocks creeping; stems leafy throughout; leaves $1\frac{1}{2}$ lines wide; flowers clustered 7. *J. falcatus*.

Stems ancipitally compressed; leaves equitant, transversely ribbed by internal septa.

Leaves 2 to 4 lines wide; stems more or less winged below the nodes; seeds reticulate 8. *J. xiphioides*.

Leaves $\frac{1}{2}$ to 1 line wide; stems not winged; seeds with the longitudinal lines closely crossed by prominent fine transverse ridges 9. *J. phaecephalus*.

1. **J. bufonius** L. TOAD RUSH. Annual; roots fibrous; stems 1 to 12 in. high, terete, branching from the base, leafy; leaves narrow; inflorescence a dichotomous cyme; flowers solitary and remote, to closely second or even sub-capitate; perianth lobes 3 lines long, long acuminate, greenish with white scarious margins.

One of the commonest species, exceedingly variable in size and aspect: Agnews, *Miss Cannon*; Marin Co.; near the Montezuma school, Solano Co., *Jepson*; Yountville, *Clarke*; Knights Valley, Sonoma Co.; West Berkeley; Stege. May-Sept.

2. **J. uncialis** Greene. DWARF RUSH. Depauperate annual $\frac{3}{4}$ to 1 in. high; leaves short, radical; stems scapiform, strictly 1-flowered; perianth segments $1\frac{1}{2}$ to 2 lines long, acute, hyaline, with a prominent mid-nerve; capsule obtuse, apiculate, equaling the perianth; testa reticulate.

Type locality: "low moist places in fields near Suisun, California, May, 1890," *Greene*.

3. **J. Leseurii** Boland. SALT RUSH. Perennial; rootstock stout-

ish, creeping and widely spreading; stems 1 to 3 ft. high, stout, erect, terete, leafless; panicle lateral, lax, many-flowered; flowers often somewhat secund; perianth 2 to 3 lines long; stamens 6; anthers 1 line long; capsule oblong-ovate, acute.

Salt-marshes and alkali soils, not uncommon: Little Oak, Solano Co., *Jepson*; Suisun Marshes. June.

4. **J. patens** Mey. COMMON RUSH. Perennial, forming dense clumps; rootstock creeping; stems slender, densely tufted, $1\frac{1}{2}$ to 2 ft. high, erect, terete, leafless; panicle lateral, lax, many-flowered; perianth $1\frac{1}{2}$ lines long; stamens 6; anthers $\frac{1}{2}$ line long; capsule subglobose, slightly angled, obtuse, apiculate.

A very common species in marshy or springy ground: Lobos Creek, *Kellogg*; Oakland Hills, *Bolander*; Suisun Marshes, *Jepson*; Mill Valley; Berkeley. June-July.

5. **J. effusus** L. BOG RUSH. Perennial, forming dense clumps; rootstock creeping; stems stout, tufted, $1\frac{1}{2}$ to 3 ft. high, erect, terete, leafless; panicle lateral, lax, many-flowered; perianth 1 line long; stamens 3; anthers $\frac{1}{2}$ line long; capsule clavate-obovate, obtuse or retuse.

Common in marshy ground: Angwins, Howell Mt., *Jepson*; Lorin. June. Var. **BRUNNEUS** Engelm.; panicle shorter, more compact; perianth dark brown.—Marin Co., *Michener* and *Bioletti*.

6. **J. tenuis** Willd. YARD RUSH. Perennial, forming dense clumps; rootstock tufted; stems slender, 1 to 2 ft. high, very leafy at base, naked above, terete; leaves less than $\frac{1}{2}$ line wide, grass-like, 9 in. long; panicle terminal, loose, spreading; spathe exceeding the inflorescence, 8 to 16 lines long; perianth segments pale; stamens 6. Var. **CONGESTUS**, Engelm.; panicle contracted, somewhat capitate; common near the coast.—Oakland Hills, *Bolander*; Marin Co., *Michener* and *Bioletti*; West Berkeley; Point Isabel. Apr.-June.

7. **J. falcatus** Mey. Perennial; rootstock slender, creeping; stems 6 to 9 in. high, more or less leafy, terete; leaves usually equaling or exceeding the stems, $1\frac{1}{2}$ lines wide, not ribbed by transverse septa; flowers in dense many-flowered terminal heads, which are solitary or in twos or threes; spathe about equaling the inflorescence; perianth segments dark brown, concolorous or with a broad green midvein.

Drift sand on Lone Mt., San Francisco, *Bolander*; Santa Cruz Mts., *Brewer*. Mar. Var. **PANICULATUS** Engelm. heads smaller, 3 to 5-flowered, in a more or less cymose panicle.—swampy meadows at Mendocino City, *Bolander*; Lake Co., *Simonds*; should be looked for in northern Sonoma Co. June.

8. **J. xiphioides** Mey. MARSH RUSH. Perennial; rootstock elongated, stout, nodes distant; stems $1\frac{1}{2}$ to 3 ft. high, erect, leafy, ancipitally compressed, more or less distinctly winged below the nodes; leaves 2 to 4 lines wide, compressed, equitant, the spaces between the veins divided into segments by distinct transverse septa; inflorescence usually much exceeding the leaves, terminal; flowers in

a cymosely-paniculate inflorescence of densely few or many-flowered heads; perianth usually dark-colored, about $2\frac{1}{2}$ lines long; stamens 6; anthers usually small; style very short; seeds elongate, reticulate, with minute cross-lines within the reticulations.

A common species in salt-marshes and moist places: Cloverdale, *State Survey*; Pajaro Hills, *Chandler*; Lorin; Belmont. June. Var. *AURATUS*, Engelm. is characterized by the lax cymosely-paniculate inflorescence of usually pale-colored flowers.—Suisun Marshes, *Jepson*; Stege; Saratoga, Santa Clara Co. Sept.—Oct.

9. *J. phæocephalus* Engelm. Perennial; rootstock elongated, stout; nodes somewhat distant; stems $\frac{2}{3}$ to $1\frac{1}{2}$ ft. high, erect, leafy, ancipitally compressed, not winged; leaves $\frac{1}{2}$ to 1 line wide, compressed, equitant, more or less distinctly ribbed by transverse septa; inflorescence usually barely exceeding the leaves, terminal; flowers in densely many-flowered solitary or binate heads; perianth dark brown, $1\frac{1}{2}$ to 2 lines long; stamens 6; anthers large; style long; stigmas exserted; seeds ovoid, the longitudinal lines closely crossed by prominent fine transverse ridges.

Apparently less common than the preceding species: Lone Mt., San Francisco, *Bolander*; Lake Pilarcitos, San Mateo Co. June.

2. *LUZULA* DC. WOOD-RUSH.

Plants of dry or high ground in open or shady places. Stems hollow, leafy, simple, slender. Leaves softer and flatter than in *Juncus*, grass-like and often hairy or villous. Flowers solitary in umbels or panicles or crowded in dense clusters or spikes. Capsule 1-celled; seeds 1 to 3. (Latin *lucus*, wood or grove, on account of the habitat of certain species.)

1. *L. comosa* Mey. COMMON WOOD-RUSH. A sparsely villous perennial; rootstocks sparsely tufted; stems erect, leafy, 12 in. high; leaf-blades 3 to 6 in. long, 2 to 3 lines wide, flat, villous at the throat and sparsely so on the margins; bract foliaceous, much exceeding the inflorescence; inflorescence $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flowers spicate; spikes erect, simple or cymosely pedunculate; bractlets scarious, hyaline and ciliate above; perianth lobes $1\frac{1}{2}$ lines long, tinged with dark-brown.—(*Juncoides comosum* Sheldon.)

One of the earliest flowers of spring, frequenting partially shaded spots: Berkeley; Olema. Mar.—Apr. Var. *SUBSESSILIS* Wats. has solitary or few-nearly sessile loose pale-colored spikes.—Olema. Var. *CONGESTA* Thuill. has several close sessile spikes forming a more or less conical head.—Lake Merced.

6. TYPHACEÆ. CAT-TAIL FAMILY.

Reed-like aquatic perennials, the solid cylindric stems from creeping rootstocks and bearing long linear alternate leaves. Flowers monœcious, in dense spikes or heads, without perianth. Stamens and ovaries with bristles or minute scales intermixed. Ovary 1-ovuled,

with a slender style, becoming in fruit a seed-like nut. Embryo straight, embedded in copious endosperm.

Flowers in dense cylindrical spikes 1. *TYPHA*.
Flowers in globular heads, the lower with foliaceous bracts . . . 2. *SPARGANIUM*.

1. *TYPHA* L. CAT-TAIL.

Stems tall, simple, ending above in a long spike, the pistillate portion below merely contiguous to or quite separated from the staminate portion above. Stamens intermixed with hairs, their filaments connate. Ovaries minute, surrounded by numerous hairs. Nuts very small, usually splitting on one side, enveloped in a copious down. (Ancient Greek name of the Cat-tail.)

1. *T. latifolia* L. CAT-TAIL. Stout, $3\frac{1}{2}$ to 6 ft. high; leaves very long, linear, sheathing at the base; flowers in a spike 7 to 13 in. long, the pistillate portion below contiguous to the staminate portion above; pistillate portion dark brown, at length 1 in. thick; staminate portion yellow, rather thicker when in flower, but soon deciduous leaving a bare spike.

Common in marshes and marshy places by creeks in the Coast Ranges and Lower Sacramento and Lower San Joaquin.

2. *SPARGANIUM* L. BUR-REED.

Stems simple or somewhat branched. Flowers in globose heads scattered along the upper portion of the stem or its branches; lower heads pistillate, with leaf-like bracts; upper heads staminate. Stamens with minute scales interposed, their filaments slender and elongated. Ovaries surrounded by 3 to 6 linear-subulate scales forming a sort of perianth. (Sparganion the Greek name, diminutive of sparganon, a swaddling-band, on account of the narrow ribbon-like leaves.)

Pistillate heads 2 on a branch, always sessile; nuts 2 lines wide or less

1. *S. Greenei*.
Pistillate heads 2 to 4 on a branch, peduncled or less commonly sessile; nuts mostly 3 lines wide 2. *S. eurycarpum*.

1. *S. Greenei* Morong. GREENE'S BUR-REED. Stems 3 to 5 ft. high; leaves triangular, channeled, partly clasping at base and flattened towards the apex, $\frac{1}{2}$ in. wide; inflorescence branching, 13 to 16 in. long; pistillate heads 2 on a branch, sessile, in fruit 1 in. broad; staminate heads 10 to 17 on a branch; nuts broadly cuneate, rounded at summit and with a short beak, obviously but not sharply angular, 4 lines long, 2 (or rather less than 2) lines wide.

Olema, Marin Co.; San Francisco Peninsula. Fruiting in Oct.

2. *S. eurycarpum* Engelm. BROAD-FRUITED BUR-REED. Erect, rather slender, 3 to 8 ft. high, with branching inflorescence; leaves flat and thin, slightly keeled beneath; pistillate heads 2 to 4 on the stem or branch, sessile or more commonly peduncled; staminate heads 5 to 13; heads in fruit $\frac{3}{4}$ to $1\frac{1}{4}$ in. in diameter; nuts obovate, many-angled, with a broad rounded or hemispherical summit, tipped with the short style, 3 (or nearly 3) lines broad, 4 lines long, including the style—(*S. Californicum* Greene.)

Calistoga, Lower Sacramento and southward to Santa Clara Co. June-July.

S. SIMPLEX Huds. SIMPLE BUR-REED. Stems slender, simple, erect, 1 to 2 ft. high; leaves triangular or flattened, exceeding the stem; heads 2 to 4 of each kind, sessile or the lower often on a peduncle $\frac{1}{2}$ to 2 in. long and above the axil; staminate heads very small; nuts nearly terete, attenuate at each end, tipped with a linear style, the whole 3 or 4 lines long.—Sierra Nevada: Placer Co., *Carpenter*; Carson Pass, *Brewer*.

7. LEMNACEÆ. DUCKWEED FAMILY.

Minute floating or submerged aquatic perennials, without leaves. Plant body consisting of a leaf-like stem or "frond" which is densely green, disk-shaped, elongated or irregular. Inflorescence a simple cluster of 2 staminate flowers and 1 pistillate flower, contained in a cleft or pouch on the margin of the frond. Staminate flower consisting of a single stamen and the pistillate flower of a single ovary containing 1 to 7 ovules. Perianth none. Flowers and fruit scarce, in 1 species unknown. Vegetative reproduction active and taking place by lateral branching, the branches being attached by slender stalks (stipes). These branches soon separate or remain connected for some time; they may at certain seasons sink to the bottom of the pond or ditch and undergo a resting period. The account of genera and species here given has been adapted almost entirely from Mr. Chas. H. Thompson's Revision published in the 9th Report of the Missouri Botanical Garden.

Frond with 1 to several nerves and a single root; ovules 1 to 7 . . . 1. *LEMNA*.
Frond without nerves; root none; ovule 1 2. *WOLFFIA*.

1. *LEMNA* L. DUCKWEED.

Fronds disk-shaped, usually with a central nerve and with or without several lateral nerves, each with a single root which is commonly provided with a root cap. Reproductive pouches 2, appearing as clefts in either margin of the basal portion of the frond, each containing a cluster of 3 flowers surrounded by a spathe. Ovary with 1 to 7 ovules. Fruit ribbed. (Ancient Greek name.)

Frond with a long stipe, mostly submerged and forming large masses; papillæ none 3. *L. trisulca*.

Frond with a short stipe, floating on the surface.
Symmetrical or nearly so, papillate along the median line.

Oblong-obovate; fruit more or less lenticular.

Upper surface uniformly green; margin of the fruit without appendages; seed always 1 2. *L. minor*.

Upper surface mottled with irregular brown streaks; margin of the fruit with rounded wing lobes; seeds 1 to several 1. *L. gibba*.

Oblong to elliptical, small, green on both surfaces; with a row of papillæ along the mid-nerve; fruit elongated 5. *L. minima*.

Unsymmetrical,

Obliquely obovate; obscurely 3 to 7-nerved, papillate along the median line 1. *L. gibba*.

Long oblong, thin, obscurely 1-nerved; papillæ none 4. *L. cyclostasa*.

1. *L. gibba* L. GIBBOUS DUCKWEED. Fronds 1 to 4 in a group, commonly 2, orbicular to obovate, slightly to very unsymmetrical, usually 3 to 5-nerved, 1 to 2 lines wide, 1 to $2\frac{1}{2}$ lines long, thick, convex and slightly keeled above, flat to strongly gibbous beneath; base usually acute and commonly with narrow wing margins; pistil clavate; ovules 1 to 7; fruit symmetrical, purple-tinted, winged with rounded lobes at the upper margin on either side of the stigma.

Abundant in ponds.

2. *L. minor* L. SMALLER DUCKWEED. Fronds solitary or few in a cluster, round to elliptic-obovate, green or purplish beneath, uniformly bright-green above, convex on both sides, upper surface sometimes slightly keeled and with a row of papillæ along the mid-nerve, the apical one usually quite prominent; pistil clavate; ovule 1; fruit not winged, projecting about $\frac{1}{3}$ beyond the margin of the frond.

Covering the surface of stagnant ponds. Variable.

3. *L. trisulca* L. IVY-LEAVED DUCKWEED. Fronds forming dense masses, oblong to oblong-lanceolate, slightly unsymmetrical and frequently a little falcate, $2\frac{1}{2}$ to 5 lines long and $1\frac{1}{2}$ lines wide, the long stipe attached to the basal margin; floating fronds with shorter stipes and cavernous throughout the central portion; submerged fronds with long twisted stipes; seed prominently 12 to 15-ribbed.

Cold springs and running water.

4. *L. cyclostasa* (Ell.) Chev. Fronds solitary or more commonly 2 to 8 cohering in a more or less curved chain, thin, oblong to obovate-oblong, usually somewhat falcate, $\frac{1}{3}$ to $\frac{3}{4}$ lines wide by 1 to $1\frac{1}{4}$ lines long, without papillæ; base of the frond usually unsymmetrical, tapering into a short stipe or frequently sessile; fruit long-ovate, pointed by the long, straight or rarely curved style; seed 12 to 29-ribbed.

Springs at foot of Uncle Sam Mountain, Lake Co., *Bolander*.

5. *L. minima* Phil. Fronds cohering in twos, sometimes in fours, or solitary, oblong to elliptical, symmetrical, $\frac{1}{2}$ to $1\frac{1}{4}$ lines wide, $\frac{3}{4}$ to 2 lines long, rather thick, with a row of papillæ along the mid-nerve; lower surface flat or slightly convex, upper surface slightly to prominently convex with thin margin entirely around the frond; frond cavernous in the middle portion only, commonly nerveless; seed oblong, pointed, about 16-ribbed.

Two growth stages; smaller fronds straw-yellow or pale green and strikingly convex on the upper surface; larger fronds thinner and green colored.

2. *WOLFFIA* Horkel.

Very minute plants. Fronds rootless, thin, unsymmetrical, curved in the form of a segment of a band, abundantly punctate on both surfaces with brown epidermal pigment cells. Stipe attached on the margin of the single reproductive pouch which appears as a cleft in the basal margin of the frond. Flowers and fruit unknown. (J. F. Wolff, student of the genus *Lemna*.)

1. *W. lingulata* Hegelm. Fronds at maturity solitary or rarely in 2's, broadly tongue-shaped, $\frac{3}{4}$ to $1\frac{1}{2}$ lines wide, $1\frac{1}{4}$ to $3\frac{1}{4}$ lines long, cavernous throughout the lower central portion; reproductive pouch triangular.

Irrigation canals, Kern Co., *Thompson*.

8. NAIADACEÆ. PONDWEED FAMILY.

Aquatic plants entirely submerged or with floating leaves. Stems jointed. Leaves linear and grass-like or some with broad floating blades, sheathing at base or with sheathing stipules. Flowers inconspicuous, naked or with a very small calyx, commonly borne on a short spike or spadix, which bursts from an enclosing greenish bract or spathe. Ovaries 1, or 2 to 4, distinct, free from the calyx if that be present, 1-celled, 1-ovuled.

Flowers perfect.

Sepals 4, distinct 1. POTAMOGETON.

Sepals none 2. RUPPIA.

Flowers monœcious or diœcious.

Leaves entire.

Pistils about 4, borne in a cup-shaped involucre; fresh water ponds or streams 3. ZANNICHELLIA.

Pistils many, borne on the side of a linear spadix; maritime.

Flowers monœcious; fruit ovoid; leaves 2 to 4 lines broad 4. ZOSTERA.

Flowers diœcious; fruit sagittate-cordate; leaves $\frac{1}{2}$ to 2 lines broad . . . 5. PHYLLOSPADIX.

Leaves with spiny-toothed margins; pistil solitary and naked 6. NAIAS.

1. POTAMOGETON L. PONDWEED.

Perennial herbs, commonly growing in still fresh waters, with mostly alternate leaves in 2 ranks and membranous stipules more or less united and sheathing. Spikes sheathed by the stipules in the bud, in flower mostly raised on a peduncle to the surface of the water. Flowers small, perfect. Sepals 4, rounded, concave, valvate in the bud, short-clawed. Stamens 4, inserted on the claws of the sepals, the anthers nearly sessile. Ovaries 4, becoming ovoid or roundish drupelets. (Greek potamos, a river, and geiton, a neighbor, on account of the aquatic habit.)

Stipules axillary and free from the leaf.

Floating leaves elliptical, submerged leaves lanceolate . . . 1. *P. lonchites*.

Leaves all submerged,

Ovate or lanceolate, many-nerved; spike 2 to $2\frac{1}{2}$ in. long . . 2. *P. lucens*.

Linear, 1 to 3-nerved.

Spike subcapitate; stem flattened; leaves not glandular 3. *P. pauciflorus*.

Spike interrupted or subcapitate; stem filiform; leaves often bi-glandular at base 4. *P. pusillus*.

Stipules adnate to the leaves or petioles; leaves all submerged, capillary . . . 5. *P. pectinatus*.

1. *P. lonchites* Tuckerm. Stems much branched, 3 to 6 ft. long; floating leaves coriaceous, elliptical, 2 to $3\frac{1}{2}$ in. long, less than $\frac{3}{4}$ to $1\frac{1}{2}$ in. wide, the petiole usually longer than the blade;

submerged leaves very thin, lanceolate, 4 to 12 in. long, rounded at base or tapering into a petiole 1 to 4 in. long; stipules 1 to 4 in. long; peduncles 2 to 3 in. long; spikes 1 to 2 in. long, densely fruited; nutlets obliquely obovate, $1\frac{3}{4}$ to 2 lines long.

Streams: Russian River southward to Santa Cruz; Sierra Nevada.

2. *P. lucens* L. Stem branching below and often with masses of short leafy branches at summit; leaves all submerged, thin, elliptical to lanceolate or oblanceolate or the uppermost oval, many-nerved, acute or acuminate, mucronate, often undulate-serrate, narrowed at base to a short petiole or sessile, 2 to 7 in. long and $\frac{3}{4}$ to $1\frac{3}{4}$ in. wide; nerves 13 or fewer; stipules loose and spreading, sometimes very broad; peduncles 3 to 6 in. long; spikes 2 to $2\frac{1}{2}$ in. long, very thick cylindrical; nutlet $1\frac{1}{2}$ lines long, nearly as broad.

San Francisco Peninsula.

3. *P. pauciflorus* Pursh. Stems flattened, much branched, 1 to 3 ft. long; leaves all submerged, narrowly linear, 3-nerved or the nerves obscure, 1 to 2 in. long, $\frac{1}{2}$ to 1 line wide, narrowed at base; stipules small, white, becoming setose; peduncles more or less clavate, about $\frac{1}{2}$ in. long; spike subcapitate, few-flowered; nutlet 1 line long, roundish or obliquely obovate, with a broad more or less undulate-dentate keel.

Still waters; near the coast.

4. *P. pusillus* L. Stems filiform, branching, $\frac{1}{2}$ to 1 ft. long; leaves all submerged, narrowly linear or often nearly setaceous, obtuse and mucronate or acute at apex, 1 to 3-nerved, with 2 glands at base or rarely glandless, 1 to 3 in. long, $\frac{1}{4}$ to $\frac{3}{4}$ line wide, sessile; stipules obtuse, becoming setose; peduncles flattened, slender, $\frac{1}{2}$ to 3 in. long; spikes interrupted or capitate; nutlet obliquely elliptical, $\frac{3}{4}$ to 1 line long, curved and 2-grooved on the back, or sometimes with 3 distinct keels, beaked by a short style.

Pools and ditches. Coast Ranges.

5. *P. pectinatus* L. Stems slender from a running rootstock, the branches repeatedly forking, 1 to 3 ft. long; leaves capillary or setaceous, often 1-nerved, 1 to 6 in. long; stipules $\frac{1}{2}$ to 1 in. long, free for half their length; peduncles filiform, 2 to 12 in. long; flowers in distinct whorls on a spike $\frac{1}{2}$ to 2 in. long; nutlets roundish or obliquely obovate, $1\frac{1}{2}$ to 2 lines long, no middle keel on the back but with obscure lateral ridges.

Brackish water of tide sloughs or in ponds.

2. *RUPPIA* L. DITCH-GRASS.

Immersed aquatic herbs with long filiform forking stems. Leaves almost capillary, with a rather broad sheathing base. Peduncle of the spadix axillary, at first very short and enclosed in the sheathing spathe-like base of the leaf. Spadices slender, each with two flowers disposed near together, rising to the surface when in anthesis. Flowers perfect, entirely destitute of perianth. Stamens 2, sessile, each anther consisting of 2 large and separate anther-cells. Pistils

4; stigmas depressed, sessile. Pistils after flowering becoming stalked. (In honor of H. B. Ruppius, a German botanist.)

1. *R. maritima* L. Plants 2 to 3 ft. long; leaves 2 to 3 in. long; pistils ripening into hard ovoid nuts, which at maturity are $\frac{3}{4}$ to $1\frac{1}{4}$ lines long, and raised on stipes 1 to 12 lines long; fruiting peduncle 3 to 6 lines long.

Alkaline or brackish water: tidal canal ditches near Petaluma, *Davy*; Byron Springs, *Hansen*; southward to Southern California. June–Sept.

3. ZANNICHELLIA Mich.

Immersed branching plants. Leaves alternate or mostly opposite, filiform but flat. Flowers monœcious, naked, sessile, usually both kinds in the same axil. Staminate flower consisting of a single stamen with a slender filament. Pistillate flowers 2 to 5 (usually 4), borne in a cup-shaped involucre or spathe, the ovary flask-shaped with broad hyaline stigma. Nutlet coriaceous, somewhat flattened, beaked. (In honor of Zannichelli, a botanist of Venice.)

1. *Z. palustris* L. HORNED PONDWEED. Fruit somewhat incurved, occasionally more or less toothed on the back.

Mt. Diablo region and southward.

4. ZOSTERA L.

Submerged maritime herbs with elongated and very narrow grass-like radical leaves and inflorescences raised on peduncle-like stems. Flowers monœcious, borne in 2 rows on the face of a flattened spadix with or without small lateral appendages covering them in the bud and closely invested by a protecting foliaceous spathe until anthesis. Staminate flower of 1 stamen. Pistillate flower of 1 pistil. Fruit ovoid, 1-seeded, indehiscent. (Greek *zoster*, a girdle or band, on account of the ribbon-like leaves.)

1. *Z. marina* L. EEL-GRASS. GRASS-WRACK. Leaves with long sheathing bases, 3 to 7-nerved, 1 to 2 or 3 ft. long, 2 to 5 lines broad; fruiting leaves jointed at base of spathe, which terminates with a more or less elongated leaf-like summit; spadix 2 to 4 in. long, 10 to 20-fruited.

Shoal waters of bays, especially on muddy bottoms. Tomales Bay.

5. PHYLLOSPADIX Hook.

Maritime aquatics closely related to the preceding, with elongated narrowly-linear radical leaves from much branched creeping root-stocks. Flowers diœcious, borne in 2 rows on the side of a flattened spadix, with a lateral chartaceous appendage covering each flower in the bud, the whole inflorescence enclosed by a spathe which is produced beyond the spadix as a foliaceous prolongation. (Pistillate spadices with rudimentary anther-cells.) Anthers sessile. Pistil simple, with 2 stigmas; ovary sagittate-cordate, *i. e.*, with two downwardly-produced horns at base, which in fruit are strongly developed and bear on the inside deflexed bristles which serve to attach the

floating achenes to other plants on the beaches. (Greek phyllon, leaf, and spadix, a kind of inflorescence.)

Flowering stems 1 ft. long or more, bearing 2 to 5 pistillate spadices

Flowering stems 2 or 3 in. long, bearing 1 pistillate spadix or rarely 2: leaves more obviously 3-nerved 1. *P. Torreyi*.
 2. *P. Scouleri*.

1. *P. Torreyi* Wats. TORREY'S EEL-GRASS. Rootstocks brittle, leaves $1\frac{1}{2}$ to 2 ft. long, $\frac{1}{2}$ to 1 line broad; flowering stems 1 ft. long or more, bearing 2 to 5 pistillate spadices, each 1 to $1\frac{3}{4}$ in. long; staminate spadices shorter and with shorter peduncles; mature fruit $2\frac{1}{2}$ lines long.

Low tide limits to two fathoms below, from San Diego, *Cleveland*, and San Pedro northward to Monterey, *Setchell*; Land's End, *Gibbs*; and Russian River, *Dudley*.

2. *P. Scouleri* Hook. PACIFIC EEL-GRASS. Very similar to the preceding but the leaves rather broader, $\frac{3}{4}$ to 2 lines wide; flowering stems short, but 2 or 3 in. long, bearing but 1 pistillate spadix, rarely 2; fruits larger.

Santa Barbara, Pacific Grove, and Russian River acc. to *Dudley*; Dillon's Beach, *Baker*, and northward to the mouth of the Columbia River.

6. *NAIAS* L. NAIAD.

Slender branching submerged plants with linear opposite spiny-toothed leaves, which are seemingly whorled on account of the ones crowded in the axils. Flowers unisexual, solitary in the axils. Staminate flower consisting of a single stamen enclosed in the bud in a little membranous spathe. Pistillate flower consisting of a single ovary and short style bearing 2 to 4 stigmas. Fruit a seed-like nutlet. (Greek Naias, a water-nymph.)

Sheathing base of the leaves entire or with few teeth 1. *N. marina*.
 Sheathing base of the leaves with many minute teeth 2. *N. flexilis*.

1. *N. marina* L. HOLLY-LEAVED NAIAD. Stems stout and often armed with prickles twice as long as their breadth; leaves broadly linear, with 6 to 10 spine-pointed teeth on each margin, the broad sheathing base entire or with 1 or 2 teeth on each side; fruit 2 to $2\frac{1}{2}$ lines long, reticulated, tipped with a long persistent style; seed reticulated, not shining.

Clear Lake, *Bolander*.

2. *N. flexilis* R. & S. SLENDER NAIAD. Stems slender; leaves narrowly linear, with 25 to 30 minute teeth on each margin, the broad sheathing base with 5 to 10 small teeth on each side; fruit 1 to 2 lines long, nearly smooth; seed reticulated, shining.

San Francisco Peninsula; Clear Lake.

9. JUNCAGINACEÆ. ARROW-GRASS FAMILY.

Marsh or sub-aquatic acaulescent herbs with radical rush-like or grass-like leaves, and small perfect flowers in racemes or spikes, or

solitary. Perianth 4 to 6-parted, its segments in two series, sepal-like. Stamens in ours 6 or 1. Ovaries either 3 to 6, or 1, when more than 1 united around a central axis and separating at maturity into 1-seeded carpels. Seeds anatropous; embryo straight.

Flowers perfect, with perianth; stamens 6 1. *TRIGLOCHIN*.

Flowers polygamous, the pistillate of 2 kinds; no perianth; stamen 1 2. *LILÆA*.

1. *TRIGLOCHIN* L.

Perennials by means of short rootstocks; leaves fleshy with membranous sheaths. Flowers small, in a spike-like, bractless raceme, raised on a scape. Segments of the perianth concave, greenish, deciduous, the three inner inserted higher. Stamens in ours 6; anthers sessile or nearly so. Pistils in ours commonly 6 (rarely 3 to 5), their ovaries united around a central axis, splitting when ripe into 1-seeded carpels, which separate from the base upward, and leave a slender persistent axis. Stigmas as many as the ovaries, plumose. Carpels dehiscing by the ventral suture. (Greek tri, three, and glochis, a point, referring to the fruit of the 3-carpeled species.)

Scapes stout; leaves 2 lines wide or more 1. *T. maritima*.

Scapes slender, almost wiry, less than 1 line wide 2. *T. concinna*.

1. *T. maritima* L. COMMON ARROW-GRASS. Terminal portion of the rootstock covered with the sheaths of old leaves; scapes stout, 1 ft. long or somewhat more, bearing a raceme 10 to 15 in. long, the whole surpassing the (2 to 3 lines wide) leaves; flowers 1 line long, longer than the pedicels, these in fruit conspicuously decurrent; carpels 3-angled, with the dorsal angles winged, making a broad longitudinally-striate groove on the back, $2\frac{1}{2}$ lines long, the stigmas persistent and recurved; seed narrowly linear, 1 line long.

Marshy shores of San Francisco and Suisun Bays.

2. *T. concinna* Davy. SLENDER ARROW-GRASS. Leaves usually less than 1 line wide; scapes very slender and racemes looser than in the preceding, 7 to 13 in. high; flowers about $\frac{1}{2}$ line long; carpels rather less than 2 lines long; fruiting pedicels less obviously decurrent.

With the preceding.

2. *LILÆA* HBK.

Aquatic or sub-aquatic herb with fibrous roots and radical grass-like leaves, sheathing at base. Flowers polygamous, in 2 kinds of inflorescence, one an axillary inflorescence, consisting of solitary pistillate flowers borne in the axils of the radical leaves, the other a spicate inflorescence, consisting of spikes raised on scapes shorter than the leaves. Axillary inflorescence:—ovary naked, sessile, with elongated filiform style and capitate stigma; fruit flattish, oblong-ovate, coriaceous, longitudinally ribbed, 1-seeded, indehiscent. Spicate inflorescence:—pistillate flowers on the lower part of the spike, perfect at the middle, staminate above; pistillate flowers similar to those in the axils of the radical leaves, but with a short style and with

the ovary maturing into a more compressed fruit which is winged; perfect flowers with the ovary behind (next to the axis of the spike) and the stamens in front (next to the bract); staminate flowers consisting of a single stamen in the axil of a bract.

1. *L. subulata* HBK. Leaves 6 to 8 in. long, 1 to 2 lines wide; spikes dense, $\frac{1}{2}$ in. long or less; pistillate flowers in the axils of the radical leaves often with a style 1 to 3 in. long, their fruits $2\frac{1}{2}$ to 3 lines long.

Ponds and vernal pools almost throughout California: Sonoma; Napa Valley; Solano Co.; San Francisco; Santa Clara Valley. Apr.

10. ALISMACEÆ. WATER-PLANTAIN FAMILY.

Marsh or aquatic herbs with radical leaves, scape-like flower stems and perfect or unisexual flowers. Perianth of 3 outer herbaceous persistent sepals, and 3 inner white deciduous petals. Stamens 6 or more. Ovaries numerous, distinct, 1-celled, 1-ovuled, becoming achenes in fruit. Endosperm none; embryo strongly recurved or folded.

Flowers perfect; stamens 6; achenes in a single whorl 1. *ALISMA*.

Flowers unisexual; stamens numerous; achenes in a dense head . 2. *SAGITTARIA*.

1. *ALISMA* L.

Erect herbs, growing in shallow water or mud, with radical long-petioled leaves. Inflorescence a panicle consisting of whorled branches each bearing a simple or compound umbel of perfect flowers. Perianth of 3 outer small herbaceous segments, and 3 much larger inner ones, these petal-like and very delicate. Stamens 6, with short filaments. Ovaries distinct on a disk-like receptacle. Achenes numerous, channeled on the back, crowded in a whorl. (*Alisma*, the Greek name, used by Dioscorides.)

1. *A. Plantago* L. WATER PLANTAIN. Rootstock perennial, becoming almost bulbous by the sheathing bases of the petioles; leaves radical, the blades elliptic-oblong, acute, 2 in. long, varying to 8 in. long and 3 in. broad and tapering from the middle to each end, on petioles twice as long; flowering stems from $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, the whorled branches unequal in length and forming a loose, pyramidal panicle; flowers white, on pedicels 1 in. long or less; petals 1 line long; achenes very strongly flattened, oblong, 1 line long, 17 to 25 in each whorl.

Common along the margins of ponds, rivers, and marshy shores of lakes: San Francisco; Alameda; Stockton; Lower Sacramento; Napa Valley. The aquatic forms have very narrow leaves.

2. *SAGITTARIA* L. ARROW-HEAD.

Marsh or aquatic herbs with fibrous roots and milky juice. Leaves broadly sheathing, commonly sagittate or sometimes without basal lobes or even without a blade. Stems scape-like, bearing one to several whorls of flowers, usually in threes, with membranous bracts.

Flowers in ours monœcious, the staminate above. Ovaries numerous, crowded on a globose receptacle. Achenes flat, more or less winged and beaked by the short style. (From the Latin sagitta, an arrow, referring to the shape of the leaves.)

Pedicels of pistillate flowers slender, ascending; leaves sagittate.

Basal lobes much shorter than the upper one or equaling it; racemes with few to several whorls 1. *S. latifolia*.

Basal lobes less than twice as long as the upper one; racemes with numerous whorls 2. *S. Greggii*.

Pedicels of pistillate flowers much thickened and reflexed in fruit; leaves not lobed at base; racemes with few whorls 3. *S. Sanfordii*.

1. *S. latifolia* Willd. COMMON ARROW-HEAD. Leaves very variable, the smallest but 2 or 3 in. in total length, the largest 7 or 8 in. long from the summit of the petiole to the obtuse or abruptly acute apex; basal lobes lanceolate to broadly ovate, acuminate, divaricate, 15 in. or less from the tip of one to the other; scape simple or branched, $\frac{1}{4}$ to 3 ft. high; bracts scarious, $2\frac{1}{2}$ to 5 lines long, the pedicels of the pistillate flowers very much longer; flowers monœcious; stamens 25 to 35; achene $1\frac{1}{2}$ lines long with somewhat swollen dorsal wing and long horizontally oblique beak.

Common on the islands and river shores of the interior. The tubers of this species are edible and are made much use of by the Chinese of the Lower Sacramento. From these tubers a long root-stock grows out in the Spring, which, at its upper end, gives rise to leaves and scapes.

2. *S. Greggii* J. G. Smith. SANFORD ARROW-HEAD. Stout, erect; leaf-blades 8 to 18 in. long, the widely divergent lanceolate basal lobes longer than the ovate and acuminate or lanceolate upper lobe; scape erect, 5-angled below, branching at its summit into several ascending, for the most part long racemes, with numerous whorls of flowers; bracts lanceolate, acuminate, 7 to 14 lines long, equaling or rather shorter than the pedicels; stamens 30 or more; achenes 1 to $1\frac{1}{2}$ lines long, tumid, crested on both margins, circular or the ventral margin almost straight, nearly beakless.

Stockton, *Sanford*, original and only known locality in California.

3. *S. Sanfordii* Greene. STOCKTON ARROW-HEAD. Leaves 2 to 3 ft. long; petioles obtusely triquetrous, $\frac{1}{2}$ to $1\frac{1}{2}$ in. thick at the base; blades linear- to oblong-lanceolate, about 4 in. long, tapering into the spongy petiole or almost obsolete in submersed plants; scapes stout, $1\frac{1}{2}$ ft. high or more; bracts triangular, $2\frac{1}{2}$ to 3 lines long, connate at base; whorls of flowers few, the pedicels of the pistillate ones reflexed in fruit; sepals ovate, 2 to 3 lines long; stamens 20, the anther longer than the filament; achenes 1 line long, rather markedly winged on both the inner and outer margins, the sides reticulated; beak oblique, short, triangular.

Stockton, *Sanford*; not otherwise known. The sepals of the pistillate flower in this and the preceding species are reflexed or spreading. *S. Montevicensis* C. & S. is (acc. to J. G. Smith) a ballast plant at Stockton; it may be known by its erect accrescent sepals and by a brownish-purple spot at the base of the petals.

11. LILIACEÆ. LILY FAMILY.

Ours perennial herbs. Stems from bulbs, corms or rootstocks, either scape-like and the leaves all radical, or more or less leafy and frequently branching. Flowers regular and perfect; perianth with 6 segments or lobes, consisting of 3 sepals and 3 petals, usually colored alike. Stamens 6, sometimes 3 or 4. Ovary superior, 3-celled; style or stigmas 3. Fruit a capsule or berry. *Maianthemum* has a 2-merous flower and *Scoliopus* a 1-celled ovary. The flowers in *Veratrum* are polygamous. *Trillium* has netted-veined leaves.

A. Fruit a capsule.

Plants with bulbs or corms.

Stems leafy from a scaly bulb, some of the leaves often whorled, or in 2 species mostly at base.

Flowers less than $1\frac{1}{2}$, mostly less than 1 in. long; style often 3-cleft; perianth-segments with a more or less circular nectar-bearing area towards the base. 1. FRITILLARIA.

Flowers much larger, always showy; style one; perianth-segments not bearing nectaries, but with a nectar-bearing groove towards the base. 2. LILIUM.

Stems from corms; leaves all at base and the stems either scapes or scape-like, but with few or reduced cauline leaves in no. 5 and in some species of no. 4.

Flowers solitary or racemose, bractless, borne on a scape-like stem; perianth segments equal or nearly so; leaves 2, at the base of the stem, broad. 3. ERYTHRONIUM.

Flowers solitary on a simple stem, terminal on the branches or umbellately fascicled but without involucre or circle of bracts; outer perianth segments commonly greenish and much smaller than the inner showy ones which usually bear a conspicuous glandular pit near the base; leaves few, narrow and elongated, all radical or 1 or 2 cauline.

Flowers in racemes terminating the branches; bracts subulate; perianth with a narrow tube and reflexed segments; stamens 6; staminodia 6. 4. CALOCHORTUS.

Flowers in umbels, always with 2 or more bracts; leaves all radical. 5. ODONTOSTOMUM.

Perianth-segments united below into a tube.

Perianth-tube scarlet, the short segments chrome-green. 6. BREVOORTIA.

Perianth of one color, blue, purple, white, or yellow; stamens 6, often with appendaged or winged filaments or 3 of the stamens replaced by dilated sterile filaments or staminodia 7. HOOKERA.

Perianth-segments distinct or nearly so.

Filaments arising from a cup-like appendage 8. BLOOMERIA.

Filaments not appendaged, sometimes dilated at base.

Leaves semi-terete; bracts 4 to 6. 9. MUILLA.

Leaves plane or convolute-filiform; bracts 2 or 3. 10. ALLIUM.

Stems from tunicated bulbs; perianth segments distinct; leaves all or mainly radical.

Style 3-cleft, at least slightly; capsule loculicidal, as in all the preceding.

Flowers in a simple raceme borne on a scape 11. CAMASSIA.

Flowers racemose in a widely branching very ample panicle. 12. CHLOROGALUM.

Styles 3, distinct; capsule deeply 3-lobed, septicidal; flowers in a raceme or panicle, the perianth segments with green glands at base. 13. ZYGADENUS.

Plants with vertical rootstocks.

Stem simple, tall, and leafy; panicle pubescent; styles 3, distinct; capsule 3-lobed, septicidal. 14. VERATRUM.

Stem simple; leaves numerous, sedge-like, mostly radical, those of the stem reduced; stamens 6.

Flowers in a dense raceme; filaments glabrous; styles 3, distinct.

15. XEROPHYLLUM.

Flowers in loose racemes; filaments densely woolly; style one, undivided.

16. NARTHECIUM.

Acaulescent; leaves 2; stamens 3, opposite the sepals. 17. SCOLIOPUS.

Stem simple, bearing at summit a whorl of 3 broad netted veined leaves and a single large flower; stamens 6. 18. TRILLIUM.

B. Fruit a berry; plants with rootstocks.

Leaves broad.

Stem very short, the leaves arising from near the surface of the ground; flowers red, in umbels, raised on a peduncle. 19. CLINTONIA.

Stem simple, leafy; flowers very small, white.

Raceme short, simple, terminal; perianth-segments and stamens 4, leaves 1 to 3, cordate, petioled. 20. MAIANTHEMUM.

Raceme simple or compound, terminal, composed of many small flowers; leaves several to many, sessile. 21. SMILACINA.

Stems branching; flowers axillary at the ends of the leafy branches.

22. DISPORUM.

Leaves reduced to scales; branchlets filiform, clustered in the axils; bushy-branching plant. 23. ASPARAGUS.

1. FRITILLARIA L.

Stems erect, simple, from a bulb of thick fleshy scales; radical leaves large, ovate or elliptic; cauline sessile, alternate or whorled. Flowers solitary or in racemes, dull purple, brownish, pink or scarlet. Perianth campanulate to funnelform, deciduous, of 6 distinct segments, each segment with a shallow nectar-bearing area or pit near the base. Stamens 6, inserted on the base of the segments, included; filaments slender; anthers extrorse, more or less versatile. Ovary sessile or nearly so. Capsule membranaceous, 6-angled or winged, loculicidally 3-valved. Seeds numerous, in 2 rows in each cell. (From the Latin *fritillus*, a dice-box, the application uncertain.)

Styles united, stigma shortly 3-lobed; perianth pink, of a uniform color, *i. e.*, not spotted; glands obscure. 1. *F. pluriflora*.

Styles 3-parted above; stigmas linear; glands mostly obvious.

Leaves in 2 to 3 whorls on the upper part of the stem or the uppermost alternate; capsule winged.

Perianth scarlet. 2. *F. coccinea*.

Perianth dark-purple, mottled or checkered with greenish-yellow.

Segments $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, at least the inner with crisped or erosulate margins; raceme commonly 4 to many-flowered. 3. *F. mutica*.

Segments 1 to $1\frac{1}{2}$ in. long, the margin entire; racemes 1 to 4-flowered.

4. *F. lanceolata*.

Leaves mostly basal, not in distinct whorls; capsule obtusely angled.

Raceme many-flowered; perianth yellowish-green, not spotted, 1 to $1\frac{1}{2}$ in. long. 6. *F. agrestis*.

Raceme 1 to 3-flowered.

Perianth brownish or black-purple or greenish with interrupted purple lines, $\frac{3}{4}$ to 1 in. long. 5. *F. biflora*.

Perianth white or nearly so, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. 7. *F. liliacea*.

1. *F. pluriflora* Torr. PINK FRITILLARIA. Stems 6 to 10 in. high, from a somewhat yellowish bulb of few (6 to 8) scales; leaves few, oblong-lanceolate, 4 in. long, mostly basal; perianth uniform pink-purple, the segments obovate-oblong, acutish, 1 in. long; glands obscure; stamens $\frac{2}{3}$ the length of the petals, the filaments slightly dilated at base; capsule as broad as long, truncate at apex, narrowed toward the base, strongly 3-lobed, each lobe with 2 longitudinal dorsal ridges or wings with intervening depression.

Adobe hills in upper Vaca Valley, *Jepson*, 1885; Sweeny Creek, Solano Co., *Platt*, 1898; upper Sacramento Valley on the Sierran side. Feb. The segments are usually deeper colored or longitudinally lined at base and often also with a longitudinal and very narrow brown band running from base to apex. Fleshy tap-like roots are often formed below the bulb, similar to those occurring on *Hookera capitata*.

2. **F. coccinea** Greene. SCARLET FRITILLARIA. Stems slender, 10 to 18 in. high; leaves 3 to 7, narrowly linear, $2\frac{1}{2}$ in. long; flowers 1 to 4, campanulate-funnelform, scarlet, evidently mottled, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; segments recurving at tip, gland near base of segment small, narrowly oblong, 3 lines long.

Hood's Peak, Sonoma Co., *Bioletti*; Mt. St. Helena, *Jepson*; Ukiah, *Purdy*. Last of Apr. and first of May. There seem to be forms identical with this, save that the color characters are those of the next; hence this species may need to be made a variety.

3. **F. mutica** Lindl. MISSION BELLS. RICE-ROOT LILY. Scales few or none, the lower portion of the solid bulb covered with roundish bulblets like rice-grains; stems $1\frac{1}{4}$ to $2\frac{1}{3}$ ft. high, glaucous; radical leaf 1 ft. long or less, 3 to 5 in. wide, usually not present in the second (flowering) season; stems leafy above the base only; leaves 2 to 6 in a whorl (the whorls mostly 2 or 3), or the upper alternate, lanceolate or linear, 4 in. long or less; bracts similar but smaller; raceme 3 to 17-flowered; pedicels less than 1 or 2 in. long, often recurved after anthesis; perianth campanulate, dark-purple or greenish, conspicuously spotted or checkered, 6 to 13 lines long; segments broadly oblong or narrowly ovate, distinctly crisped or erosulate-margined, usually concave-carinate towards the base, the outer often broader; gland greenish, broadly lanceolate, extending from the base $\frac{1}{2}$ or $\frac{2}{3}$ the way to the apex; capsule with 8 broad wings at base and apex, 6 to 8 lines long.

Shady woods of the Coast Ranges; the most common species: Berkeley; Vacaville; Sonoma. Mar. The var. *GRACILIS* (*F. lanceolata* Pursh var. *gracilis* Wats.) has very small flowers and narrower more acuminate segments; anthers scarcely longer than broad.—Corte Madera (Marin Co.), northward to Ukiah, *Purdy*.

4. **F. lanceolata** Pursh. CHECKER LILY. Bulbs of few thick scales $\frac{1}{2}$ in. long; stem $1\frac{1}{2}$ to 2 ft. high; leaves 6 to 9 in 2 or 3 whorls on the upper part of the stem, ovate-lanceolate, 2 to 4 in. long; pedicels 1 in. long or less; perianth broadly campanulate, dark-purple mottled with greenish-yellow, 1 or mostly $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; segments ovate to oblong, deeply concave, with a very large ovate-lanceolate gland in middle of concavity; gland deep-green, sharply defined, often with minute black dots; stamens 6 to 8 lines long; anthers $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; capsule broadly winged, less than 1 in. long.

Vicinity of the ocean from Lake Pilarcitos, San Mateo Co., *Davy*; Inverness, *Jepson*; Mendocino Co., *Bolander*, and northward. Feb.—Mar.

5. **F. biflora** Lindl. BLACK LILY. Stem stout, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high,

2 to 3 (rarely 1)-flowered; leaves 2 to 6, mostly near the base, scattered or somewhat whorled, broadly to narrowly oblong, 2 to 4 in. long; perianth campanulate, more or less greenish but mostly dark purplish or purple-lined, 8 to 12 lines long; segments oblong, tapering to each end, or the inner segments elliptic-obovate, all with a longitudinal greenish glandular band running from the base nearly to the apex.

Ukiah, southward near the coast to Riverside (H. M. Hall) and San Diego. Imperfectly known species.

6. **F. agrestis** Greene. STINK BELLS. Stems 1 to $1\frac{1}{2}$ ft. high, leaves 8 to 12, oblong-ob lanceolate to linear-lanceolate, 4 to 5 in. long; raceme 3 to 8-flowered, the flowers nodding on the pedicels which are abruptly recurved at summit; perianth yellowish-green, the mid-nerve prominent; segments 1 to $1\frac{1}{4}$ in. long, 4 to 5 lines wide.

Antioch, *Davy*, where it occupies wide acres of the grain fields, flowering in Apr.; bulbs very deep-seated, not turned up by gang plows. Mr. *Davy* describes the odor as very obnoxious.

7. **F. liliacea** Lindl. WHITE FRITILLARIA. Stems 3 to 8 in. high, often somewhat stout and succulent, 1 to 5-flowered; leaves of the radical tuft narrowly or broadly oblong, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; cauline leaves few, linear-oblong or linear; flowers dull white; perianth segments oblong-ovate to obovate, 6 to 9 lines long, with a greenish purple-dotted gland at base, the greenish area sometimes extended upwards along the mid-vein nearly or quite to the apex; stamens 4 lines long, shorter than the styles; anthers 1 to $1\frac{1}{2}$ lines long; capsule stipitate, truncate at each end, $\frac{1}{2}$ in. long and as broad.

Bleak hilltops at San Francisco; flats near Point Richmond; rocky summits of Mare Island. Feb.-Mar.

2. LILIUM L. LILY.

Stems simple, tall and leafy, from a scaly bulb. Leaves narrow, sessile. Flowers large and showy, solitary or 2 to several in a terminal raceme. Perianth campanulate or funnel-form; its segments 6, yellow, red or white, often dotted or spotted with brown, distinct, equal, spreading or recurved, with a nectar-bearing groove toward the base. Stamens 6, hypogynous, included; anthers versatile. Style one, long, deciduous; stigma 3-lobed. Capsule loculicidal; seeds numerous, flat, horizontal, in 2 rows in each cell. (Greek *lilion*, the classical name of these plants.)

Flowers yellow or reddish, conspicuously spotted, nodding; leaves lanceolate in 3 or 4 whorls and alternate above and below 1. *L. pardalinum*.

Flowers horizontal; leaves narrowly oblanceolate or linear, rarely whorled 2. *L. maritimum*.

Flowers nearly white, becoming reddish, somewhat dotted, erect or ascending 3. *L. rubescens*.

1. **L. pardalinum** Kell. TIGER LILY. Rootstock thick and fleshy, closely covered with few or several jointed closely overlapping scales, branching and eventually forming large mat-like clusters; stems $2\frac{1}{2}$ to 6 ft. high; leaves in 3 or 4 whorls, alternate above and below, the whorls with 9 to 15 leaves in each; flowers 1 to

many, racemose or the lower in whorls, on long spreading pedicels; segments 2 to 3 in. long, 6 to 9 lines wide, strongly revolute, bright orange-red with a lighter orange center and large purple spots on the lower half; capsule narrowly oblong, acutely angled, $1\frac{1}{2}$ in. long.

Stream banks and wet meadows of the Coast Ranges toward the sea and in the Sierra Nevada. June-Aug.

2. **L. maritimum** Kell. COAST LILY. Bulb conical, 1 to $1\frac{1}{2}$ in. in diameter; stems 1 to 4 ft. high with alternate or rarely whorled leaves; these narrowly oblanceolate or linear, 1 to 5 in. long and 3 to 7 lines wide; flowers 1 to 5, horizontal on long pedicels; segments deep reddish-orange, spotted within with purple, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, the upper $\frac{1}{2}$ somewhat recurved; stamens less than 1 in. long, exceeding the style; capsule said to be long and narrow.

Low meadows near the coast from Marin Co., northward to Humboldt Co.

3. **L. rubescens** Wats. Bulbs rhizomatous, 2 in. in diameter; stem 2 to 5 ft. high; lower leaves scattered, the upper in 3 to 7 whorls; flowers several on ascending pedicels 1 to 3 in. long, nearly white, somewhat dotted with brown, ageing to rose-purple; segments $1\frac{1}{2}$ or 2 in. long, the upper $\frac{1}{3}$ revolute; capsule obovoid with subtruncate apex and abruptly short attenuate base, wing-angled, $1\frac{3}{4}$ in. long.

Wooded slopes in the mountains from Marin Co., to Howell Mountain, Napa Co., and northward. Near the coast called Redwood Lily; towards the interior Chaparral Lily.

3. ERYTHRONIUM L.

Low herbs from deep-seated membranous-coated corms and simple stems with the leaves radical or borne below the middle, or in plants flowerless in a given season there is but one broad long-petioled leaf. Flowers large, solitary or several and racemose; perianth segments distinct with longitudinal nectar-bearing groove and 2 or 4 scale-like processes at base, or only the inner segments so provided. Stamens 6, hypogynous, shorter than the perianth. Style 3-lobed or -cleft; stigmas 3. Capsule somewhat 3-angled, loculicidal. (Derived from the Greek *eruthros*, red, in allusion to the color of the flowers in some species.)

1. **E. grandiflorum** Pursh. Scapes 5 to 9 in. high, 1 to 3 or even 4 or 5 flowered; leaves mostly 2, oblong, obtuse, 4 to 6 in. long, 1 to $1\frac{1}{2}$ in. wide; flowers nodding, from white to pale lemon-yellow, the bases of the segments orange; segments broadly oblong, tapering from the middle or below the middle to base and apex, $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. long, 5 to 7 lines wide; inner segments longitudinally 2-channeled on back; stamens 5 lines long; capsule obovoid, 1 in. long.

Cloverdale (where it is very abundant and called "Easter Lily," Setchell) and northward. Mar.

4. CALOCHORTUS Pursh. MARIPOSA LILY.

Stems from membranous-coated corms, with few narrow radical or

cauline leaves and showy white, yellow, lilac or bluish-tinged flowers borne terminally on the stem or branches or in an umbellate fascicle. Perianth deciduous, the segments distinct and more or less concave. Sepals lanceolate, greenish or sometimes colored. Petals for the most part broadly cuneate-obovate and usually with a conspicuous gland or pit near the base. Stamens 6, on the base of the segments. Ovary triquetrous; stigmas sessile, recurved, persistent. Capsule elliptical or oblong, membranaceous, 3-angled or -winged, commonly septically dehiscent. Seeds numerous, in 2 rows in each cell, somewhat flattened. (Greek *kalos*, beautiful, and *chortos*, grass, in allusion to the flowers and grass-like leaves.)

Flowers and capsule erect, the former open campanulate; gland densely hairy; stem bearing bulblets at base; radical leaves usually a pair, channeled, linear.—**MARIPOSA LILIES.**

Petals mostly white or lilac, with an eye-spot; gland round; capsule linear or linear-clavate. 1. *C. venustus*.

Petals clear lilac; gland small, round and densely hairy, or absent; capsule linear. 2. *C. splendens*.

Petals yellow, usually without eye-spot; gland lunate; capsule attenuate from a broad base. 3. *C. luteus*.

Flowers erect or ascending, campanulate; petals with a transverse scale covering upper portion of gland; capsule nodding; stem low, bulblet-bearing in none of the following except the first; the radical leaf long and conspicuous, surpassing the inflorescence.—**STAR TULIPS.**

Petals lilac, glabrous or nearly so; stem bulblet-bearing at base; open wet meadows. 4. *C. uniflorus*.

Petals white with scant hairs on lower third; woodland plants. 5. *C. umbellatus*.

Petals white or purplish-blue, covered with long erect hairs. 6. *C. Maweanus*.

Flowers and capsules nodding; petals strongly incurved or arched, the gland transversely crested or hairy; capsule elliptical or broadly oblong, deeply triquetrous, the lobes thin, acute or winged.—**GLOBE TULIPS.**

Petals white; gland lunate, with 4 transverse imbricate scales fringed with short glandular hairs. 7. *C. albus*.

Petals light yellow; gland bordered with stiff hair which cross each other. 8. *C. pulchellus*.

1. **C. venustus** Dougl. **WHITE MARIPOSA LILY.** Stem erect, stiff, usually branching, 4 to 10 in. high, 1 to 4-flowered; bulblet at base usually 1; radical leaves 1 or 2, linear, 1 to 3 lines wide, very glaucous; pedicels 2 to 8 in. long; sepals oblong-lanceolate, acuminate, 1 to $1\frac{1}{2}$ in. long; petals broadly obovate-cuneate, 1 to $1\frac{3}{4}$ in. broad, 1 to 2 in. long, white to lilac with an eye-spot in the middle, frequently penciled toward the base, and often with a transversely oblong rose-colored blotch near the apex; gland roundish, lunate, or oblong, densely matted with short hairs; filaments dilated, shorter than or a little exceeding the anthers; capsule linear or linear-clavate, 2 to $3\frac{1}{2}$ in. long, the sides obliquely and rather closely veined.

Light sandy soil or in alkaline fields: Vacaville to the Mt. Diablo region and southward in the Coast Ranges; Napa Mountains, varying into bright yellow, *Tracy*. Also in the Sierras, in a modified color form. Petals mostly roundish, or even somewhat acute at apex, rarely truncate.

2. **C. splendens** Dougl. **MARIPOSA LILY.** Stems often bulblet-bearing at base, 1 to $1\frac{1}{2}$ ft. high, slender; sepals ovate, acuminate,

about equaling the petals; these broadly fan-shaped, clear-lilac, with long scattered hairs below the middle, 1 to $1\frac{1}{2}$ in. long, about as broad as long; gland small and round, covered by a dense mass of short hairs, or absent; filaments 3 times as long as the anthers; capsule linear.

Eastern Lake and Colusa Cos. to Monterey and southward.

3. **C. luteus** Dougl. **YELLOW MARIPOSA LILY.** Stem erect, slender, often branching, 7 to 10 in. high; bulblets enclosed within radical sheath of stem; radical leaves linear, 1 to 3 lines wide; sepals narrowly ovate-lanceolate, acute, yellowish within; petals fan-shaped, as long as broad, with a rather obvious claw, yellow or orange without a central blotch but with penciled lines radiating from gland to center of petal; gland broad, lunate, densely hairy, with ascending matted yellow hairs; above this to middle of petal the hairs few and scattering; stamens about equaling style, the filaments not dilated or slightly toward the base, a little longer than the anthers; capsule attenuate from a broad triangular base, $1\frac{1}{2}$ to 2 in. long.

Coast Ranges, foothills, and low rolling gravelly or dry land. May. There are named varieties which have a large purple splotch on the center of each petal and often also on each sepal. Petals $\frac{3}{4}$ to $1\frac{1}{2}$ or 2 in. long, commonly truncate at apex, rarely roundish.

4. **C. uniflorus** H. & A. Stem low, flexuous, 4 to 8 in. high, with 1 to 4 bulblets beneath the surface; radical leaves 4 to 6 lines broad, exceeding the stem; bracts linear-lanceolate, long, and conspicuous; flowers 2 to 10 in 1 to 3 umbels, on long flexuous pedicels which are 3 to 10 in. long; sepals ovate-lanceolate, greenish-lilac; petals lilac, cuneate, somewhat truncate, denticulate, 10 to 12 lines long, naked above, sparingly hairy immediately above the gland; this shallow, not pitted, with a narrow triangular appressed scale.—(*C. lilacinus* Kellogg.)

Calistoga to Monterey in low wet lands. Apr.—May.

5. **C. umbellatus** Wood. Herbage glaucous, stems 3 to 10 in. high, from a bulb, not bulblet-bearing, simple or branching; radical leaf solitary, exceeding the inflorescence; flowers 2 to 6; sepals oblong, acuminate, greenish-white, or slightly tinged with lilac; petals white or slightly lilac-tinged, obovate, or fan-shaped, slightly concave, 6 to 9 lines long; gland covered by an ascending appressed scale, which on its upper (free) margin is lightly fringed; on each side of the gland is a hairy area (with a purple spot below it), the petals otherwise naked; stamens $\frac{1}{2}$ the length of the petals.—(*C. collinus* Lemmon.)

Low wooded hills: Marin Co.; Oakland Hills; Walnut Creek, Brewer. Apr.

6. **C. Maweanus** Leicht. **PUSSY'S EARS.** Stem mostly simple, 3 to 5 in. high, bearing an umbel of 2 to 4 flowers and with mostly 1 radical leaf (1 ft. long or less and 3 to 8 lines wide) which much surpasses the inflorescence; sepals oblong or elliptical and acute, or ovate-lanceolate, equaling or much shorter than the petals; these

orbicular, obovate or somewhat rhomboidal, with a broadly or abruptly acute apex, 6 to 10 lines long, the upper surface covered with long white or bluish hairs; gland covered above with a narrow transverse scale, the petal densely hairy above the scale and naked below the pit.

San Francisco Bay northward in the Coast Ranges. Inverness, J. N. LeConte. Apr.

7. **C. albus** Dougl. **WHITE GLOBE TULIP.** Stem stout, glaucous, branching, 1 to 2 ft. high; radical leaves elongated lanceolate, acuminate, 1 to $1\frac{1}{2}$ ft. long, $\frac{1}{3}$ to 1 in. wide; bracts foliaceous, 3 to 5 in. long; sepals shorter than the petals, ovate, acuminate, greenish-white; petals white, purplish at base, with scattering long silky yellow hairs above gland, ovate-orbicular, acutish, 1 to $1\frac{1}{4}$ in. long; gland lunate, shallow, with 4 transverse upwardly-imbricate scales, fringed with close short yellow or white glandular hairs; anthers oblong, mucronate; capsule 1 to 2 in. long, $\frac{1}{2}$ to 1 in. broad, abruptly short-beaked; seeds brown, pitted.

Woods of the Coast Ranges near the coast from Ukiah, Sonoma, and Niles, to the Santa Cruz Mountains and Monterey, southward to Southern California.

8. **C. pulchellus** Dougl. About 1 ft. high, much branched, each branch terminating in an umbel of 2 or 3 pendulous flowers, the bract surpassing the peduncle; sepals greenish, ovate-lanceolate, shorter than the light yellow petals, which above the gland are covered with scattered hairs, below it smooth and with the margins ciliate; gland placed a little below the center of the petal, the margin of the pit clothed with long and thick hairs.

Occurring on Mt. Diablo; collected in early days by Douglas and little known since.

Var. **amabilis** (C. amabilis Purdy). **GOLDEN LILY BELL.** Stem flexuous, dichotomously branching, varying in height from a few in. (and 2 or 3-flowered) to $1\frac{3}{4}$ ft. high (and 10 to 12-flowered); radical leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, elongated, green and glossy, equaling or exceeding the stem; bracts linear-lanceolate, exceeding or equaling the flowers, diminishing upward, the lowest $4\frac{1}{2}$ in. long; flowers on nodding pedicels, sub-globose, golden-yellow; sepals sometimes greenish, elliptic-ovate, abruptly acute, 12 to 15 lines long, a trifle shorter than the suborbicular petals which are conspicuously ciliate on the margin and strongly arched or incurved, their apices overlapping; gland a deeply-set pit (visible from the outside as a ridge or convexity) and covered by a dense fringe of appressed yellow hairs growing from the upper margin and which cross each other over the pit; petals otherwise glabrous; anthers oblong, 2 lines long, rather shorter than the filament; capsule elliptical, $1\frac{1}{4}$ in. long.—North Coast Ranges, northward to Ukiah; Sonoma; Green Valley (Solano Co.); Vaca Mountains. Apr. Also called Cat's Ears and Fairy Lantern.

5. **ODONTOSTOMUM** Torr.

Stems flexuous, branching, from a corm. Leaves mostly radical,

sheathing the stem. Flowers in bracted racemes terminating the branches. Perianth with a narrow tube and with the limb divided into 6 soon reflexed segments, the outer 3 slightly longer and cucullate at tip; stamens 6, inserted on the throat and alternating with as many short staminodia, those opposite the outer segments longer; the stamen opposite the lower outer segment stands alone and faces the remaining 5, which approximate each other by their filaments on the upper side of the flower. Ovules 2 in each cell but only 1 maturing. Capsule obovate, 3-lobed, loculicidal. (Greek odous, tooth, and stoma, mouth, on account of the erect subulate filaments at the throat of the flower.)

1. **O. Hartwegi** Torr. Plants erect with somewhat spreading branches, 5 to 10 in. high; corm about 1 in. broad, 5 to 7 in. below the surface of the ground; radical leaves 3 to 9 in. long, 2 to 3 lines wide with caudate-attenuate apex; racemes 2 to 5 in. long; bracts and bractlets subulate; perianth-tube 3 lines long; reflexed segments nearly or quite as long, narrowly oblong, 5 or 6-nerved, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

Dry hard soil in the middle North Coast Range (Napa Valley foothills, *Jepson*); hill country west of Red Bluff, *Jepson*; Sierra Foothills, upper Sacramento Valley, *Hartweg*; Mariposa Co., *Congdon*, May.

6. BREVOORTIA Wood.

Scape erect from a corm, bearing a few-flowered umbel with jointed pedicels. Leaves linear. Perianth-tube scarlet, persistent, broadly tubular, slightly 6-saccate at the truncate base, slightly constricted above; segments chrome-green, short, erect or sometimes reflexed. Stamens 3, inserted on the throat opposite the inner segments, their filaments very short; anthers emarginate or bifid at each end and innate; staminodia 3, alternating with the stamens, broad, truncate, corona-like. Capsule triangular-ovate, acuminate, stipitate. (Dedicated to J. Carson Brevoort of Brooklyn, New York, naturalist and patron of science.)

1. **B. Ida-Maia** Wood. **IDA MAY'S FIRE CRACKERS.** Scape slender, erect, 1 to 3 ft. high, bearing an umbel of 6 to 13 flowers; pedicels $1\frac{1}{2}$ in. long, or less; perianth-tube 1 to $1\frac{1}{4}$ in. long, the segments broadly ovate, obtuse, 2 or 3 lines long; staminodia white; stipe of the capsule 2 or 3 lines long; seeds angular, black.

Wooded foothills from Marin Co. northward. Common in Mendocino and Humboldt, but the plants scattered, not in masses as is often the case with *Brodiaea*. May-July.

7. HOOKERA Salisb. BRODIAEA.

Scapes from corms, erect and straight, or sometimes elongated and twining. Leaves mostly few and grass-like. Umbels loose or capitate. Pedicels jointed beneath the perianth. Perianth-tube various. Stamens 6, or the alternate stamens replaced by dilated sterile filaments or staminodia. Filaments slender or more frequently

winged and produced beyond the anther in the form of thin appendages. Ovary on a short stipe or sessile. Capsule loculicidal, beaked by the style which splits with the valves. (William Hooker, 1779-1882, botanical artist of London.)

Umbel loose, mostly few-flowered, borne on a short rigidly erect scape; pedicels firm; perianth-tube turbinate or urn-shaped, the segments equal; g or exceeding the tube; stamens inserted high on the perianth, those with anthers 3; those opposite outer segments changed to staminodia and bearing white petal-like plates; anthers innate; corms not flattened.

Scapes almost wholly subterranean, the umbel sessile on the ground; staminodia yellowish 1. *H. terrestris*.

Scapes 3 to 18 in. high; staminodia white.

Perianth turbinate-campanulate; staminodia commonly retuse, longer than the stamens 2. *H. minor*.

Perianth-tube oblong with rotate or recurving segments; staminodia acute, mostly shorter than the stamens 3. *H. coronaria*.

Umbel capitate, many-flowered, borne on a straight erect or even very tall and twining scape; perianth-tube urn-shaped or tubular, angular or saccate and more or less inflated; segments about equaling the tube; stamens 6, all with innate anthers or those opposite the outer segments with half-sized anthers or entirely sterile; leaves mostly 2, fleshy.

Stamens with anthers 3.

Flowers rose-red or pinkish; filaments and staminodia emarginate; scapes very much elongated, commonly twining 4. *H. volubilis*.

Flowers blue-purple; anthers bifid at each end, sessile; staminodia deeply cleft 5. *H. congesta*.

Stamens with anthers 6; inner filaments with two lanceolate appendages extended beyond the anthers; outer filaments dilated at base; bracts conspicuous, of a violet-purple or metallic color 6. *H. capitata*.

Umbel loose, many-flowered, borne on a straight, erect, and rather slender scape; flowers blue, white, or yellow; perianth-tube narrowly turbinate to open-campanulate, not inflated or angular or saccate, longer or shorter than the segments; stamens 6; anthers versatile; filaments slender or winged; ovary on slender stipe or rarely sessile; corms somewhat flattened.

Flowers yellow; filaments dilated, forked at apex, the anther borne on a cusp in the middle of the notch 7. *H. ixioides*.

Flowers commonly blue or purple, sometimes pale or nearly white; filaments mainly coalescent with the perianth, the short free portion slender, not winged; anthers versatile.

Perianth violet-purple; anthers 2-lobed at base, all with distinct filaments. 8. *H. laxa*.

Perianth pale rose-purple or nearly white; "anthers retuse at apex," those opposite the outer segments sessile 9. *H. peduncularis*.

Flowers white; filaments with broadly triangular and slightly united bases. 10. *H. hyacinthina*.

1. *H. terrestris* (Kell.) Greene. Scape very short, scarcely rising above the surface of the ground, or altogether subterranean; umbels 2 to 10 or 20-flowered, the slender pedicels 3 to 4 in. long; perianth purple, 8 to 10 lines long, the limb rotate; anthers oblong, sagittate, $1\frac{1}{2}$ lines long, slightly longer than the filaments and shorter than the staminodia, these yellowish, emarginate and with revolute edges.—(*Brodiaea terrestris* Kell.)

Near the coast from Monterey and Watsonville to Mendocino; common in the sandy soil in the region about San Francisco. June-July.

2. *H. minor* (Wats.) Britten. Scapes slender, 3 to 6 in. high, bearing an umbel of 2 to 5 blue flowers on pedicels 1 to $2\frac{1}{2}$ in. long;

perianth 8 to 12 lines long, its tube oblong or even slightly inflated, the segments rotately spreading or often strongly recurved, each with a mid-vein, green on back and running down to base of perianth; outer perianth segments narrowed towards the apex, mucronulate; inner segments broadly oblong, obtuse; anthers 2 lines long, sagittate at base, deeply bifid at apex; staminodia broadly ligulate or with somewhat involute margins, at apex commonly retuse and mucronulate, somewhat (often much) exceeding the anthers.—(*Brodiaea minor* Wats.)

Dry and often gravelly soil of the plains and low hills of the Sacramento and San Joaquin Valleys. Vacaville (the anthers and staminodia incurved and closely approximate, closing the mouth of the tube).

3. *H. coronaria* Salisb. HARVEST BRODLÆA. Scape stout, 7 to 18 in. high; leaves 1 line broad, thick or somewhat terete, about equaling the scape; umbels 3 to 11-flowered; pedicels unequal, 1 to $3\frac{1}{2}$ in. long; perianth violet-purple, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. long; segments narrowly oblong, longer than the tube, in age withering and becoming caudate; anthers 4 or 5 lines long, sagittate at base, entire at apex or nearly so, exceeding or at least equaling the oblong-lanceolate mostly acute staminodia; capsule stipitate, the body about 5 lines long.—(*Brodiaea grandiflora* Smith.)

The most common species in the Bay Region, flowering in May and early June at the time of the hay harvest when the hills and fields are turning brown. Napa Valley; Niles; Santa Clara Co.; Vacaville (anthers approximate, but staminodia erect, not closing the tube). The flowers close before sunset (?).

4. *H. volubilis* (Baker). TWINING BRODLÆA. Scape roughish, 2 or 3 ft. high and lax or twining over bushes and attaining a height of 7 or 8 ft.; corm nearly 1 in. broad; leaves 1 ft. long or more, 4 to 6 lines broad, carinate; umbels short and dense, 18 to 30-flowered; pedicels $\frac{1}{2}$ to 1 in. long; perianth rose-red or pinkish, 6 to 8 lines long; tube 3 to 4 lines long and broad, 6-angled, the angles produced into sacs somewhat above the middle; segments rotate, their tips recurved; stamens 3, inserted on the throat opposite the inner segments, their filaments short, winged, emarginate; staminodia 3, opposite the outer segments, ligulate, emarginate; capsule ovate, acuminate, on a short stipe; seeds angled, black, usually 1 in each cell.—(*Brodiaea volubilis* Baker.)

Hill country of the Coast Ranges and foothills of the Sierra Nevada.

5. *H. congesta* (Smith). OOKOW. Scape 2 to $3\frac{1}{2}$ (or even 5) ft. high, often flexuous; heads short-racemose, 6 to 16-flowered, subtended by 3 to 5 ovate sub-acuminate bracts 4 lines long; leaves as long or nearly as long as the scape, 2 to 6 lines wide; flowers blue or purplish, 7 to 8 lines long, in a dense head; perianth-segments spreading, oblong, shorter or longer than the tube, which is slightly constricted at apex; stamens opposite inner perianth lobes with anthers less than $\frac{1}{2}$ as large as the others; outer perianth segments with deeply cleft

staminodia with no trace of anther-cells, surpassing the stamens; capsule sessile, 5 lines long.—(*Brodiaea congesta* Smith.)

Open hills in the Coast Ranges from the Oakland Hills northward. Apr.—May.

6. *H. capitata* (Benth.) BLUE DICKS. Scapes erect, 7 to 14 in. high, ending in a head-like umbel of 7 to 8 flowers, with about 4 dark purple or metallic bracts; these round-ovate or elliptic-oblong, 5 lines long; flowers blue, 7 lines long; perianth lobes elliptic-ovate, obtuse, 4 lines long; stamens with anthers 6; filaments opposite the inner perianth segments with a broad membranaceous wing extended beyond the anthers as two lanceolate appendages; alternate stamens with filaments dilated toward the base only, their anthers less than $\frac{1}{2}$ the size of those of the other set; appendages convergent or connivent, forming a corona and more or less concealing the anthers.—(*Brodiaea capitata* Benth.)

Very common on hillsides in the Bay Region and southward to Southern California. Feb.—May.

7. *H. ixioides* (Ait. f.). GOLDEN BRODIAEA. Scape $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, usually scabrous; leaves 2, 14 in. long or less; umbels 16 to 26-flowered; pedicels $1\frac{1}{4}$ in. long or less; flowers about 10 lines long, salmon-yellow, with a conspicuous black-purple vein on the outside running from the apex to the base of each segment; stamens alternately long and short, the filaments dilated and bifurcate at the winged summit, the oblong anthers on a cusp in the notch.—(*Brodiaea ixioides* Wats. *Calliprora ixioides* Greene.)

Common in the foothills of the Coast Ranges and Sierra Nevada. May.

Var. *lugens* (*Tritelia lugens* Greene). Broad appendages of the filaments rounded at apex, not forked; entire tube exteriorly dark brown, approaching black.—Vaca Mountains, *Greene*.

8. *H. laxa* (Benth.). GRASS NUTS. Scape 1 to 2 ft. high, rigid and stoutish, from a usually deep-seated edible corm; umbel 10 to 25-flowered; pedicels 1 in. long, more or less; perianth-tube funnel-form, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long, violet-purple, rarely white, cleft nearly to the middle; stamens 6, all anther-bearing; filaments inserted on the upper portion of the perianth-tube, free for 2 lines length above the insertion, those opposite the inner segments longer, below coalescent with the perianth-tube and reappearing near the base in the form of low longitudinal crests; anthers ovate-lanceolate with a 2-lobed base, erect though fixed above the base, $1\frac{1}{2}$ lines long; ovary on a slender stipe $\frac{1}{2}$ to $\frac{3}{4}$ in. long.—(*Tritelia laxa* Benth. *Brodiaea laxa* Wats.)

Showy and beautiful species, common in adobe fields or on adobe hillsides. May.

9. *H. peduncularis* (Lindl.). Scapes erect, slender, $1\frac{1}{4}$ to 3 ft. high; umbel 3 to 15-flowered, the pedicels slender, $2\frac{1}{2}$ to 4 or even 6 or 10 in. long; perianth pale rose-purple or nearly white, 6 to 10 lines long, cleft below the middle, the lobes widely-spreading; stamens opposite inner segments with short filaments, inserted higher than the

other 3 which are sessile on the tube; stipe of capsule 1 to 2 lines long.—(*Brodiaea peduncularis* Wats.)

Very wet ground close to water. "Clear Lake Region, *Torrey*;" Point Reyes, *Davy* (but anthers opposite outer segments not sessile).

10. *H. hyacinthina* (Lindl.) var. *lactea* (Baker). WHITE BRODIAEA. Scapes 1 to 1½ ft. high; umbels 20-flowered, more or less; pedicels rather over 1 in. long; perianth open-campanulate, cleft below the middle, white or bluish white with green mid-veins, 5 to 7 lines long; filaments with broadly triangular and slightly united bases, attenuate above and tipped with an anther ½ line long; ovary with 3 glandular pits towards the summit; capsule short-stipitate.—(*Brodiaea lactea* Wats.)

Common in low moist ground: North Coast Ranges; Monterey Co. May–June.

8. BLOOMERIA Kell.

Scape from a fibrous-coated corm. Leaves linear, carinate. Umbel with many yellow flowers; pedicels jointed at the summit and subtended by membranaceous bracts. Perianth persistent, of 6 nearly equal distinct linear-oblong segments. Stamens 6, inserted on the base of and rather shorter than the segments; filaments filiform, surrounded at base by a cup-like appendage which is free from the perianth. Capsule subglobose; seeds 4 to 8 in each cell, angular and wrinkled; style persistent and splitting with the loculicidal capsule. (In honor of H. G. Bloomer, a pioneer botanist of San Francisco.)

1. *B. aurea* Kell. GOLDEN BLOOMERIA. Scapes 6 to 9 in. high, minutely scabrous; bulb deeply seated, 6 to 8 lines in diameter; leaves 2, one of them very long, as long as the scape; pedicels 30 to 45, 1½ to 2 in. long; bracts several, subulate-lanceolate; perianth-segments narrowly oblong, subrotate when in full anthesis, 5 to 6 lines long; appendages minutely papillose; capsule nearly 3 lines long.

South Coast Ranges: Pacheco Pass, *Brewer*; southeastward and southwestward to New Idria, *Veatch* (who first collected it); Kern Co.; and Monterey. June.

9. MUILLA Wats.

Herbage without the taste or odor of onions. Scape from a fibrous-coated corm and bearing an umbel subtended by several small scarious bracts. Leaves very narrow, almost terete. Bracts 4 to 6, broadly or narrowly lanceolate. Perianth subrotate, persistent, of 6 nearly equal slightly united oblong-lanceolate segments, greenish or yellowish white with a dark 2-nerved mid-rib. Stamens inserted near the base; filaments filiform, slightly thicker below; anthers versatile. Ovules 8 to 10 in each cell; style clavate, persistent and at length splitting. Capsule globose, scarcely lobed, loculicidal. Seeds compressed and angled. (Anagram of *Allium*.)

1. *M. maritima* Wats. Corm 4 to 5 lines in diameter; scapes 3 to 9 in. high, equaled by the narrow (½ to 1 line wide) leaves; umbels 4 to 12-flowered, the pedicels unequal, 2 to 10 lines long; bracts 4 to

6, lanceolate to linear; perianth-segments 2 or 3 lines long; capsule 3 lines long, beaked by the short stout style.

Low alkaline fields, from Elmira and Marin Co. to Monterey. Flowers with a faint perfume.

10. ALLIUM L. WILD ONION.

Herbage with the characteristic taste and odor of onions. Scape from a tunicated or sometimes rhizome-like bulb or from a corm, with radical leaves, and bearing an umbel or head of flowers subtended by 2 or 3 thin whitish or scarious bracts. Leaves narrow and plane or convolute-filiform. Perianth of 6 distinct or nearly distinct equal segments, campanulate or spreading. Stamens inserted on the base of the segments; filaments often dilated below; anthers versatile. Style filiform, persistent. Capsule obovate or globose, obtusely 3-lobed, often crested; seeds 1 or 2 in each cell, black, wrinkled. (Ancient Latin name of garlic.)

Scape terete, arising laterally from a corm which propagates by bulb-bearing off-shoots.

Scape 3 or 4 in. high (?); perianth-segments twice longer than the stamens . . .

1. *A. Bolanderi*.

Scape 1 to 2 ft. high; perianth-segments $\frac{1}{3}$ longer than the stamens . . .

2. *A. unifolium*.

Scape terete, arising vertically from a tunicated bulb; leaves narrowly linear, several.

Perianth rose-color.

Ovary-cells with an obscure thickened ridge on each side toward the summit; montane . . .

5. *A. lacunosum*.

Ovary-cells with 2 very narrow central crests; low hills . . .

6. *A. serratum*.

Perianth white or light pink, leaves convolute-filiform . . .

7. *A. attenuifolium*.

Scape much flattened and 2-edged, from a tunicated bulb; leaves 2, broadly 1 near, falcae.

Perianth segments spreading at tip, nearly twice as long as the stamens . . .

3. *A. falcifolium*.

Perianth segments nearly erect, only $\frac{1}{2}$ longer than the stamens . . .

4. *A. Breweri*.

1. *A. Bolanderi* Wats. Corms sometimes clustered, oblique, the coats with an obscure delicate close undulate-serrate reticulation; scape lateral, very slender; pedicels 10 to 17, slender, 5 to 10 lines long; bracts 2, 7 or 8 lines long, ovate lanceolate, acuminate; flowers rose-color or pinkish, the very narrowly acuminate segments nearly straight, 4 or 5 lines long, twice longer than the stamens and style; filaments filiform, adnate to the middle.

Humboldt Co., first collected by Bolander.

2. *A. unifolium* Kell. Corm deeply seated, bearing a short, horizontal rootstock which gives rise to an erect scape; leaves 2 to 4, sheathing the scape below the ground, flattish, 2 to 4 lines wide, shorter than the scape; bracts 2, large, acuminate; umbels 10 to 30-flowered, the pedicels 1 to $1\frac{1}{2}$ in. long; flowers rose-color; segments broadly oblong-lanceolate, 5 to 7 lines long, $\frac{1}{3}$ longer than the stamens and styles.

Coast Ranges: Mt. Diablo; Napa Mountains. May.

3. *A. falcifolium* H. & A. Bulb-coats not reticulated; scape 2 to

3 or 4 in. high, 1 to 3 lines broad; leaves 3 to 5 lines broad; flowers rose-color, the lanceolate segments attenuate and spreading above, very minutely glandular-serrate, 4 to 7 lines long, nearly twice longer than the stamens and style; capsule acute, with 3 short narrow central crests.

Mayacamas Range from near St. Helena to the Middleton (Lake Co.) Grade. May.

4. **A. Breweri** Wats. Bulbs large, 6 to 9 lines in diameter, the coats without reticulation; scapes 1 or 2 in. high; leaves 3 to 5 lines broad; bracts acute; pedicels 4 lines long; flowers deep rose-color, the lanceolate acute segments nearly erect, 5 to 6 lines long, a third longer than the stamens; ovary and capsule with a thick, slightly lobed crest upon each cell.

Summit of Mt. Diablo, *Brewer*, no. 1060.

5. **A. lacunosum** Wats. Scape 3 to 6 in. high; bulb-coats light colored, thick and distinctly pitted by the quadrate or transversely oblong reticulation, the outline of the cells very minutely sinuous; umbels 10 to 20-flowered, the pedicels 3 to 5 lines long; bracts broadly ovate, tipped with a slender-subulate point; flowers small (3 lines long); perianth-segments oblong-lanceolate, or oblong, acute, a little exceeding the stamens; filaments narrowly deltoid below; ovary-cells with an obtuse thickened ridge toward the summit on each side.

Collected by *Brewer* on Mariposa Peak, Santa Clara Co., 1862, no. 1284; (?) Mt. Diablo, *Greene*.

6. **A. serratum** Wats. Bulb-coats with a distinct close horizontally serrate denticulation; bracts narrowly acuminate; perianth-segments pink, broadly ovate-lanceolate, 4 to 6 lines long, acute or somewhat acuminate, nearly straight and rather rigid, the inner narrower, somewhat shorter and rarely serrulate; filaments tall with a narrowly deltoid base; crests very narrow, central.

Low hills. Description chiefly from the Botany of California.

7. **A. attenuifolium** Kell. Bulb-coats commonly reddish, with a delicate transversely sinuate or serrate reticulation, the vertical lines especially also minutely sinuous; scape slender, 6 to 13 in. high, leaves narrow and becoming convolute-fliform above the sheathing base; bracts 2, short, abruptly acute; umbel erect, usually dense; pedicels 25 to 35, 3 to 8 lines long; flowers white or nearly so, the oblanceolate acuminate segments 3 or 4 lines long, more or less exceeding the stamens and style.

From San Francisco Bay and Mariposa Co. northward in both ranges of mountains.

Var. **monospermum** (*A. monospermum* Jepson). Scapes in clusters of 2 to 4; bracts 3; capsule by abortion 1-celled and 1-seeded. —Vaca Mountains.

11. CAMASSIA Lindl.

Acaulescent plants with linear leaves, slender scapes from a tunicated bulb, and dark blue or nearly white flowers in a simple raceme.

Bracts scarious. Pedicels jointed at the summit. Perianth-segments 6, distinct, oblanceolate, somewhat spreading, persistent. Stamens 6, on the base of the perianth, shorter than the segments; anthers versatile. Style filiform, slightly 3-cleft at apex, the lower part persistent. Capsule 3-lobed, loculicidally 3-valved. Seeds several in each cell. (Quamash or camass, the name of the northwest Indians.)

1. **C. Leichtlinii** Baker. CAMASS PLANT. Bulb globose, 7 to 10 lines in diameter; scape 1 to 2 ft. high; racemes loosely 7 to 18-flowered, the pedicels shorter than the narrow bracts; perianth dark blue to white, 8 to 14 lines long, nearly regular, the segments 5 to 9 (usually 7)-nerved, commonly connivent and somewhat twisted above the ovary when withering, at length deciduous; capsule oblong-obovate, slightly notched at apex, 8 to 10 lines long, obliquely veined.

Meadows and marshes near the coast, rare within our limits: Point Reyes, *Bigelow*; and northward to British Columbia, where it was first collected by John Jeffrey in 1851.

12. CHLOROGALUM Kunth.

Stem from a tunicated bulb, tall, almost leafless, branching above into a spreading panicle, the branches racemose and sparingly branched or simple. Leaves of the radical tuft long-linear, those of the stems very much reduced. Bracts small and scarious. Pedicels jointed at the summit. Perianth white or pinkish, persistent and at length twisted over the ovary; segments 6, distinct, spreading, ribbon-like, with 3 distinct but closely approximate nerves down the middle. Stamens 6, rather shorter than the segments and inserted on their bases; anthers versatile. Style long-filiform, slightly 3-cleft at apex. Capsule broadly turbinate, 3-lobed, loculicidal, with 1 or 2 seeds in each cell. (Greek chloros, green, and gala, milk or juice.)

Perianth-segments rotate-spreading in anthesis; pedicels 3 lines long or more; bulb with a thick coat of coarse fibers 1. *C. pomeridianum*.
Perianth-segments somewhat spreading from above the base; pedicels 1 line long; bulb with a membranous coat 2. *C. angustifolium*.

1. **C. pomeridianum** Kunth. SOAP PLANT. AMOLE. Plants 2 to 5 ft. high; bulbs 4 in. long and 2 in. thick with a very dense coat of coarse brown fibers; radical leaves numerous, $\frac{3}{4}$ to $2\frac{1}{2}$ ft. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. broad, carinate and with strongly undulate margin; cauline leaves few, short and long-attenuate; pedicels slender, about 3 lines long; perianth-segments 8 to 10 lines long, white, purple-veined; capsule 3 lines long, the valves pinnately nerved; seeds $1\frac{1}{2}$ to 2 lines long.

Dry open low hills and plains throughout California. July-Aug. The flowers open only in the afternoon, whence the specific name.

2. **C. angustifolium** Kell. Bulb with a membranous coat; leaves 4 to 7 in. long, 2 or 3 lines broad, becoming revolute; plant 14 to 22 in. high, the panicle with few ascending branches; flowers white with yellowish-green lines, 5 lines long, on pedicels 1 line long or less, equaling the bracts or a trifle shorter; perianth funnel-form-campanulate, its segments narrowly oblong; ovary on a short stipe.

Milton (San Joaquin Valley) and northward to the upper Sacramento. May.

13. ZYGADENUS Michx. ZYGADENE.

Stem simple, scape-like, in ours from a tunicated bulb. Herbage glabrous and somewhat glaucous. Leaves linear, mostly radical. Flowers erect, greenish-white, rather large, in a raceme or panicle. Perianth nearly rotate, withering-persistent; segments ovate to oblong-lanceolate, with a green glandular spot at the narrow but scarcely clawed base. Stamens free from the segments and about equaling them. Styles distinct, persistent. Capsule deeply 3-lobed. (Greek zugon, a yoke, and aden, a gland.)

Stamens $\frac{1}{2}$ as long as the perianth; only inner segments contracted to a broad
claw

Stamens equaling the perianth; segments all contracted to a short claw

1. *Z. Fremonti*.

2. *Z. venenosus*.

1. *Z. Fremonti* Torr. STAR ZYGADENE. Bulb globose or broadly oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, with dark coats; stem glabrous or rarely somewhat pubescent, commonly $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high; radical leaves 8 to 20 in. long, 5 to 9 lines broad, usually somewhat falcate-curving; cauline leaves few, the lower 1 or 2 mostly 5 or 6 in. long and usually shortly sheathed at base; flowers few to many in a raceme or panicle, with mostly green bracts; lower pedicels 1 to $1\frac{3}{4}$ in. long; segments 3 to 7 lines long, the outer not clawed, the inner contracted to a broad claw; gland greenish-yellow, toothed on its upper margin; stamens about half as long as the segments; styles short; ovules 10 to 20 or more in each cell; capsule oblong, 6 to 10 lines long.

Variable species common among bushes in the Coast Ranges. Apr.-June. The var. minor H. & A. is an early dwarf form, 4 or 5 in. high, with few flowers, and is found in open wet ground near the coast.

2. *Z. venenosus* Wats. HOG'S POTATO. Bulb oblong-ovate, about 4 to 6 lines in diameter; plants $\frac{1}{2}$ to 2 ft. high; leaves narrowly linear, 1 to $2\frac{1}{4}$ lines broad, carinate and usually folded, scabrous on the margin; raceme commonly simple and narrow, 3 to 5 or 10 in. long, the bracts setaceous-acuminate; perianth segments triangular-ovate to elliptical, 2 or 3 lines long, all abruptly contracted to a short claw; gland irregular on its upper side but not toothed; stamens nearly equaling the segments; capsules on erect pedicels, often contracted at apex.

Common in meadows near the coast from Monterey northward and in the Sierra Nevada from Yosemite northward.

14. VERATRUM L. FALSE HELLEBORE.

Stems tall and leafy from short thick rootstocks, bearing coarse fibrous roots. Leaves broad, plaited, coarsely nerved. Stem and inflorescence pubescent. Flowers polygamous, greenish or cream-color, in a terminal panicle. Perianth of 6 distinct obovate-oblong segments, somewhat contracted at the base, adnate to the base of the

ovary. Stamens opposite the perianth-segments and free from them, shorter by half and recurving; filaments subulate; anthers with confluent cells, cordate. Styles 3, persistent, mostly curved. Capsule 3-celled, 3-lobed. (Latin vere, truly, and ater, black, in reference to the color of the roots.)

Perianth segments oblong-obovate or oblanceolate, entire or merely denticulate near the apex; capsule oblong-ovoid, about 1 in. long. . . 1. *V. Californicum*.

Perianth segments rhombic-ovate, deeply fringed except at the base; capsule depressed-globose with notched apex, 4 lines long. . . 2. *V. fimbriatum*.

1. *V. Californicum* Durand. Stem very stout and leafy, suggesting a corn-stalk, 3 to 5 or 6 ft. high; leaves ovate or elliptic-oblong, sheathing at base, 6 to 12 in. long or the uppermost lanceolate and shorter; panicle 1 to 1½ ft. long, the lower portion often sterile; pedicels 1 to 4 lines long; perianth-segments 7 or 8-nerved, 4 to 9 lines long, with a thickened greenish margin toward the base, the margin near the apex often somewhat denticulate or erose; stamens 3 or 4 lines long; capsule nearly 1 in. to 1½ in. long.

Common in wet meadows and about springs at 5,000 to 6,000 ft. altitude in the Sierra Nevada and Yalho Bally Mountains, *Jepson*.

2. *V. fimbriatum* Gray. Similar in habit to the preceding; leaves very long and narrow, 7 to 19 in. long and about 2 in. wide; panicle 7 to 12 in. long, its branches widely spreading; pedicels 4 lines long; perianth segments rhombic-ovate, 2 to 5 lines long, the margin cleft into filiform segments, except at the broad base which bears two oblong more or less glandular spots reaching to the middle of the segment and separated by a furrow; filaments 2 lines long; styles long and slender; capsule depressed or globose and somewhat notched at apex, 4 lines long, the walls membranaceous; seed scarcely margined.

Common on the so-called plains of Mendocino Co. Mr. Davy reports a *Veratrum* as occurring at Stewart's Point, Sonoma Co., which may be this species.

15. XEROPHYLLUM Michx.

Perennials with a thick and short woody rootstock bearing cord-like roots. Radical leaves sedge-like in a dense tuft, numerous, elongated and very narrowly linear, dry, serrulate. Stem simple, stout and leafy, bearing a many-flowered raceme; pedicels slender, white. Perianth white or cream-colored of 6 distinct, several-nerved persistent segments. Stamens with rounded extrorse anthers. Ovary sessile, ovate, 3-lobed. Capsule chartaceous, loculicidal, or in some cases also septicial. Seeds 2 to 4 in each cell. (Greek xeros, dry, and phullon, leaf, the foliage very hard and dry.)

1. *X. tenax* (Pursh) Nutt. BEAR GRASS. Stem 2¼ to 3 ft. high, exceeding the radical leaves which are 1 to 3 lines wide; raceme dense, ¾ to 1 ft. long or more; pedicels 1 to 2 in. long, each with a scarious bract at base ½ as long, or the lowermost bracts foliaceous and exceeding the pedicels; perianth-segments linear-oblong, 4 lines long,

the filaments a little longer; capsule broadly ovate, acute, almost 3 lines long, loculicidally 3-valved.

Monterey, acc. to Bot. Cal.; Mt. Tamalpais, where it seems to bloom only once in seven years; Howell Mountain, Napa Co., where it is said to fruit only once in five years; northward to Mendocino Co., *Bolander*; Sierras from Placer Co., northward. Sonoma Co. plants show an irregular perianth; the (apparently) upper perianth segment is keeled, the two adjoining ones auricled or strongly oblique on the upper side at base; leaves somewhat revolute-concave as if channeled.

16. **NARTHECIUM** Mœh. BOG ASPHODEL.

Leaves narrowly linear and equitant, mostly radical, borne on a creeping rootstock. Stems rather scape-like with few radical leaves, bearing a terminal raceme of yellowish-green flowers. Pedicels with a bractlet at the middle. Perianth with 6 distinct segments. Stamens 6, the filaments densely woolly, except at the very base. Style one, attenuate upward to the stigma which is scarcely or very slightly lobed. Capsule loculicidal, with thin-chartaceous walls. Seeds numerous with a long bristle-like point at each end. (*Narthex*, Greek name of *Ferula*, the stems of which were used as rods; applied here on account of the scapose or rod-like flower stems.)

1. **N. Californicum** Baker. Leaves iris-like, 4 to 8 in. long, $1\frac{1}{2}$ to 2 lines wide; cauline leaves 2 or 3, 1 to $1\frac{1}{2}$ in. long; stems 18 or 20 in. high; raceme loose, $3\frac{1}{2}$ to $4\frac{1}{2}$ in. long; pedicels 3 to 4 lines long; perianth segments oblong-linear, acute, 3 or 4 lines long, the inner with scarious margins; ripe capsules salmon-color; seeds, including the points or tails, 5 lines long.

Sherwood Valley (Mendocino Co.) and northward, and in the northern Sierras.

17. **SCOLIOPUS** Torr.

Acaulescent, the very short subterranean stem bearing a pair of broad leaves and an umbel of greenish-purple flowers, the peduncle of which is almost obsolete, the sharply angular pedicels (which look like scapes) alone appearing above ground. Root a cluster of coarse fibers. Sepals ovate-lanceolate, purple-veined, somewhat carinate toward the base, the upper $\frac{3}{4}$ abruptly spreading or recurved. Petals linear-subulate. Stamens 3, opposite the sepals, short, with greenish extrorse anthers. Style short, its three long branches abruptly spreading horizontally, or the tip recurving. Capsule with a membranous wall which bursts irregularly. (Greek *skolios*, crooked, and *pous*, foot, in allusion to the tortuous pedicels.)

1. **S. Bigelovii** Torr. Leaves elliptic to oblong, commonly mottled with dark splotches, 4 to 8 in. long, sheathing at base; flowers with a fetid odor and having something the appearance of orchids; pedicels 4 to 9 in. long, 3-angled, slightly winged, erect in fruit, tortuous recurving or procumbent, the maturing capsule more or less hidden by leaves or forest litter; sepals 7 to 9 lines long with 10 or 12 black or purple veins; petals as long as the sepals, hardly 1 line wide,

ascending at base and with their long points convergent, forming an arch above the pistil; stamens $2\frac{1}{2}$ or 3 lines long.

Shade of redwood trees from Marin Co. to Humboldt Co. Jan.-Mar.

18. TRILLIUM L. WAKE ROBIN.

Low herbs with a tuberous rootstock and a simple stem which is naked below and bears at the summit a whorl of 3 round-ovate netted-veined leaves, and a single large flower. Perianth of 3 lanceolate, herbaceous, persistent sepals, and 3 larger marcescent petals. Stamens 6, much shorter than the segments; anthers linear, on short filaments, adnate. Ovary 3 to 6-angled, 3-celled or 1-celled at summit. Stigma sessile, elongated, stigmatic down the inside. Fruit a fleshy reddish capsule. Seeds ovate. (Name from triplum, triple, on account of the 3-merous flowers.)

Flower sessile 1. *T. sessile*.
Flower raised on a peduncle 2. *T. ovatum*.

1. *T. sessile* L. var. *Californicum* Wats. COMMON WAKE ROBIN. Stems stout, sometimes more than one from the same root; 1 to $1\frac{3}{4}$ ft. high; leaves round-ovate, $3\frac{1}{2}$ to 5 in. long, commonly broader than long; sepals shorter than the petals; these narrowly obovate, $2\frac{1}{2}$ in. long, maroon-purple, with white base or varying wholly to white; stamens 10 to 12 lines long.

Woods of the Coast Ranges; but not in the inner Coast Range. Feb.-May. The flowers are mostly white in the Napa River Basin, especially on Howell Mountain; in the Oakland Hills mostly purple. The var. *chloropetalum* Torr., with greenish petals, is common on the peninsula of Pt. Reyes in Marin Co.

2. *T. ovatum* Pursh. COAST TRILLIUM. Plants 8 or 10 in. high; leaves ovate to round, sometimes disposed to be rhombic, abruptly acute, $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long; peduncle erect; petals oblong-lanceolate to ovate, 1 to $1\frac{1}{2}$ in. long, white changing to deep rose-color; sepals of about the same shape and size or narrower; stamens 3 to 6 lines long; capsule broadly ovate, somewhat winged.

Woods near the coast from Santa Cruz, Mt. Tamalpais and Olema northward. Mar.-Apr.

19. CLINTONIA Raf.

Apparently acaulescent, the stem from a creeping rootstock, very short and bearing at or from beneath the ground few broad leaves and a scape-like peduncle. Flowers few to many in a terminal umbel or with 1 to several small supplementary clusters scattered along the peduncle. Perianth resembling a very small lily flower, campanulate, of 6 distinct deciduous segments. Stamens 6, with filiform filaments, inserted on the base of the segments; anthers fixed just above the base, extrorse. Ovary 2 to 3-celled; ovules 2 to 3 in each cell; style slender, slightly 2 to 3-lobed, deciduous. Fruit a smooth ovoid dark-berry. (In memory of De Witt Clinton of New York.)

1. *C. Andrewsiana* Torr. Leaves commonly 5, sometimes 6,

narrowly or broadly oblong, rather abruptly short pointed, 7 to 13 in. long, 2 to 4½ in. broad; peduncle 15 to 20 in. high, bearing a terminal umbel of 16 to 19 flowers and with 2 to 4 scattered clusters borne laterally, the lateral clusters 1 to 4-flowered or rarely none; flowers 5 to 8 lines long, rose-red or pink; filaments thickened toward the base and pubescent below the middle.

Shade of woods near the coast from the Santa Cruz Mountains to Marin Co., and northward to Humboldt Co. May-June. Said to occur in the ravines about Redwood Peak, Oakland Hills. C. UNIFLORA Kunth, of the Sierras, has 1 or 2 white flowers.

20. MAIANTHEMUM Wigg.

Stem low from a horizontal rootstock, bearing 2 or 3 broad leaves and white flowers in a terminal raceme, the pedicels solitary or 2 or 3 in a cluster. Perianth-segments 4. Stamens 4, with filiform filaments. Ovary 2-celled; stigma 2-lobed. Fruit a red globose berry. (Greek maios, May, and anthemon, flower, in allusion to the flowering period.)

1. *M. bifolium* DC. var. *dilatatum* Wood. Stems simple, erect, 4 to 14 in. high, bearing 2 or 3 ovate or triangular-cordate leaves, 2½ to 4½ in. long, the petiole of the lower one sometimes longer than the blade; radical leaf very long-petioled, almost as tall as the flowering stem; raceme peduncled, ½ to 2 in. long; pedicels 1 to 2 lines long; perianth-segments oblong-obovate, 1 to 1½ lines long, becoming deflexed; berry 3 lines in diameter.

Swampy places near the coast from Marin Co., northward.

21. SMILACINA Desf. FALSE SOLOMON'S SEAL.

Stems simple and leafy, from horizontal rootstocks, bearing a terminal raceme or panicle of small white flowers with minute bracts. Leaves alternate, sessile, many-nerved. Pedicels jointed at the summit. Perianth persistent, the segments distinct and spreading. Stamens with subulate filaments inserted at the base of the segments; anthers versatile. Ovary sessile, ovate, 3-celled; style short and thick, 3-lobed at the summit, persistent; ovules 2 in each cell. Fruit a globose, 1 to 3-seeded berry. Seeds subglobose, with thin testa and horny albumen. (Diminutive of *smilax*.)

Flowers in a simple raceme; perianth segments twice as long as the stamens.

Flowers in a panicle; filaments broad and much longer than the perianth segments. 1. *S. sessilifolia*.
 2. *S. amplexicaulis*.

1. *S. sessilifolia* Nutt. Rootstock slender; stem 1 to 2 ft. high, usually flexuous above; leaves lanceolate or oblong-lanceolate, 2 to 6 in. long, acute or acuminate, sessile and clasping, more or less pubescent; raceme open, sessile or shortly peduncled, the spreading solitary pedicels 2 to 7 lines long; perianth-segments 1½ to 4 lines long, lanceolate, the stamens half as long; style nearly equaling the ovary; berry red-purple or nearly black, globose, 3 to 5 lines in diameter, 1 to 4-seeded; seeds whitish, subovoid, 2 lines long.

Shady woods of the Coast Ranges from Monterey Co. to Oakland, the Napa Mountains and westward to the ocean, and northward. Mar.-Apr.

2. *S. amplexicaulis* Nutt. Rootstock stout, elongated; stem 1 to 3 ft. high, this and the under surface of the leaves with a minute fuzzy pubescence or rarely glabrous; leaves oblong-ovate to lanceolate, 3 to 7 in. long, acute at apex, sessile by a broad clasping base; panicle usually short peduncled, oblong, 2 to 4 in. long; pedicels solitary, 1 line long or less; perianth segments less than 1 line long; filaments lanceolate or broadly subulate, much longer and often broader than the segments; style very short; berry light red, very finely sprinkled with dark red dots, 2 to 2½ lines in diameter, usually 1-seeded; seed whitish, 1½ lines broad.

Shades of woods. Range of the preceding, but also in the Sierras. Apr.

22. *DISPORUM* Salisb. FAIRY BELLS.

Rootstocks short, horizontal, bearing fibrous roots and giving rise each year by a terminal bud to an erect stem, which is branched above and leafy. Leaves alternate, ovate, thin, transversely-veined between the primary nerves. Flowers greenish or white, drooping on a terminal peduncle, solitary or few in an umbel. Perianth narrowly campanulate, deciduous. Filaments attached within the anthers, above the base. Fruit a berry. (Greek di, two, and spora, seed, some species with two seeds in each cell of the ovary.)

Flowers greenish, ½ in. long; style glabrous, entire; leaves mostly cordate at base. 1. *D. Hookeri*.
Flowers whitish, ¾ to 1 in. long; style densely short-hairy, slightly 3-cleft at apex; leaves mostly rounded or subcordate at base. 2. *D. Menziesii*.

1. *D. Hookeri* (Torr.) Britton. Roughish-pubescent, 1 to 2½ ft. high; leaves ovate, sessile by the cordate base, abruptly acute or attenuate, 1½ to 3 in. long, the uppermost somewhat oblique; perianth green, narrowly campanulate, 5 to 6 lines long, the tips of the segments spreading; stamens equaling or exceeding the perianth; anthers much longer than the filaments; style glabrous, entire; berry obovate, obtuse, scarlet.

Shades of woods: Santa Cruz Co.; Oakland Hills; Mt. Diablo; north of San Francisco Bay (Marin Co. to Napa Valley) but not reported from the inner North Coast Ranges. Mar.-May.

2. *D. Menziesii* (Don.) Britton. Soft-pubescent or almost glabrous; stems 1 to 3 ft. high; leaves ovate, or sometimes round-ovate to ovate-lanceolate, rounded or subcordate (and often a little oblique) at base, at apex acuminate-attenuate, 2 to 4 in. long; perianth whitish, broad and cup-shaped at base, ¾ to 1 in. long, the tips of the segments erect; stamens shorter than the perianth; style densely short-hairy, except at the very base, slightly 3-cleft at apex; fruit oblong-obovate, attenuate above into a short beak, ½ in. long, salmon-color.

Along stream banks in the outer Coast Range woods: San Mateo Co., northward to Ross Valley; Olema; Big River and Long Valley (Mendocino Co.). Mar.-Apr.

23. ASPARAGUS L.

Stems from rootstocks, very much branched and with filiform branchlets clustered in the axils of the scaly leaves. Flowers small, solitary or in umbels or racemes. Perianth-segments alike, distinct or slightly united, the stamens inserted on their bases. Ovary 3-celled, with 2 ovules in each cell; style short, stigmas 3, recurved. Fruit a globose berry. (Ancient Greek name.)

1. *A. officinalis* L. ASPARAGUS. Rootstock much branched; stems tall and branching, 3 to 5 ft. high, when young stout, succulent and edible; clustered branchlets 4 to 8 lines long; flowers green, pendulous on jointed peduncles; perianth campanulate, 3 lines long, with included stamens; berry red, 4 lines in diameter.

An escape from the gardens. Abundant in low lands about Alameda and Bay Farm Island.

12. IRIDACEÆ. IRIS FAMILY.

Perennial herbs, ours low, with stout stems and 2-ranked sword-like and sheathing leaves. Inflorescence terminal. Flowers perfect, with petal-like perianth of 6 divisions in 2 whorls. Stamens on the base of the outer whorl, with extrorse anthers. Ovary 3-lobed, becoming a 3-celled capsule.

Stems terete; divisions of the perianth in two unlike whorls. . . 1. IRIS.

Stems 2-edged or -winged; divisions of the perianth alike. . . 2. SISYRINCHIUM.

1. IRIS L. FLAG.

Stems terete, from creeping stout rootstocks. Flowers in the axils of spatheaceous bracts. Perianth-tube prolonged beyond the ovary; outer segments or sepals obovate above the claw, spreading or recurved; inner segments or petals narrower, erect. Style divided into 3 petal-like branches, each branch with 2 lobes or appendages at summit; stigma a small projecting shelf (stigmatic only on the upper surface) situated on the lower surface of the branch just below the lobes or appendages. Stamens with linear anthers lying close beneath the branches of the style, *i. e.*, opposite them. Capsule oblong, 3-angled. Seeds flattened or turgid, in 2 rows in each cell. (Greek iris, the rainbow, the Greek species of the genus being celebrated for its brilliant colors. I. Hartwegi Baker, of the Sierras in the Sugar Pine belt, may be known by its separate often distinct bracts, leafy stems and India-yellow flowers; the following species have the bracts of the spathe closely approximate.)

Flowers 3 to 5 in a cluster, pale violet or the sepals white, veined with purple; perianth tube 3 lines long. 1. *I. longipetala*.

Flowers 2 or 3 in a cluster, cream-color or azure; perianth-tube 6 to 12 lines long. 2. *I. Douglasiana*.

Flowers 1 or 2 in a cluster, violet; perianth-tube $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long. 3. *I. macrosiphon*.

1. **I. longipetala** Herbert. Leaves 10 to 22 in. long, 4 to 6 lines broad, equaling or rather exceeding the flower-peduncles; pedicels $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; bracts scarious at apex, $2\frac{1}{2}$ to 4 in. long, $\frac{3}{4}$ to $1\frac{3}{8}$ in. broad (when spread out); sepals white, veined with violet or violet above, 3 in. long, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. broad, narrowed to a short claw, the claw with a very prominent ventral ridge which disappears in the middle of the blade; petals light violet, $2\frac{3}{4}$ in. long, 6 or 7 lines wide; anthers 8 lines long; lobes above the stigma broader and more obtuse than in no. 3, more evidently overlapping; capsule narrowed at each end, 2 in. long.

Point Isabel (Contra Costa Co.) and about San Francisco, where it is very common; thence southward to Monterey.

2. **I. Douglasiana** Herbert. Stem $1\frac{1}{4}$ to 2 ft. high, much exceeded by the (4 to $6\frac{1}{2}$ lines wide) radical leaves; bracts broader and less acuminate than in the next; flowers 2 or 3 in a pair of bracts, mostly cream-color or azure; the pedicels 1 in. long; perianth-tube 6 to 12 lines long; sepals 2 in. long or more; capsule narrowly oblong, $1\frac{3}{4}$ to 2 in. long.

Common in the Coast Ranges from the Vaca Mountains and Howell Mountain southward to San Mateo Co. May-June. The color of the flowers is exceedingly variable, but the species may be known from the next by its long pedicels, shorter perianth-tube and stouter habit.

3. **I. macrosiphon** Torr. GROUND IRIS. Stems low and slender, much shorter than the leaves which are 5 to 10 in. long and 2 lines broad; bracts lanceolate, long acuminate, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long; flowers 1 or 2, very shortly pediceled, with slender tube $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; perianth violet-purple; sepals oblong-obovate, their lower or middle portion blotched or veined with white, the margin above often undulate, about $1\frac{3}{4}$ in. long; petals oblanceolate, of a uniform color; anthers 6 lines long; capsule about 1 in. long.

San Mateo and Marin Cos. northward. Apr.

2. SISYRINCHIUM L. BLUE-EYED GRASS.

Glabrous plants. Stems slender, 2-edged or -winged, often geniculate, from fibrous roots, with grass-like or lanceolate leaves and fugacious, relatively small flowers in umbels enclosed by 2 sheathing herbaceous bracts, with scarious bractlet subtending each pedicel. Perianth 6-parted, the divisions alike, spreading. Stamens monadelphous, their anthers alternate with the branches of the style; stigmas thread-like. (Name of Theophrastus for a bulbous plant allied to Iris.)

Flowers purplish-blue; filaments united to the top 1. *S. bellum*.

Flowers yellow; filaments united only at base 2. *S. Californicum*.

1. **S. bellum** Wats. BLUE-EYED GRASS. NIGGER-BABIES. Erect, 10 to 15 in. high, the stems somewhat branching; leaves shorter than the stem, 1 to $2\frac{1}{2}$ lines wide; bracts 1 in. long, enclosing about 7 flowers; perianth purplish-blue, segments oblong-obovate, conspicu-

ously 4 to 6-nerved, emarginate at apex, with a slender tooth in the notch, 7 lines long, the inner narrower; anthers short-sagittate; style terminated by an abruptly thickened or obclavate structure, the attenuate portion being divided into 3 short stigmas; capsule globose, 2 to 3 lines long; seed obscurely pitted.

Very common throughout California. Mar.-Apr. Called "Azulea" and "Vilella" by Spanish-Californians.

2. *S. Californicum* Ker. GOLDEN-EYED GRASS. About the size of the last but the stems unbranched and the leaves somewhat broader; bracts rather unequal, enclosing 3 to 7 flowers; perianth bright yellow; segments 4 to 6 lines long, 5 to 7-nerved, obtuse or acutish; anthers $1\frac{1}{2}$ lines long, about equaling the filaments; style cleft below the middle; capsule obovate-oblong, 4 lines long.

Wet places near the coast from San Diego northward beyond California. Apr.

13. ORCHIDACEÆ. ORCHID FAMILY.

Perennial herbs with corms, bulbs, tuberous roots or rootstocks and sheathing leaves often reduced to scales. Flowers perfect, irregular, bracted, either solitary or in spikes or racemes. Sepals 3, alike. Petals 3, 2 alike; the third petal called the "lip" commonly dissimilar in color, size and shape, often enlarged, sac-like or spurred, in our genera most frequently brought into an inferior position (*i. e.*, on the lower side of the flower), by twisting of the ovary. Filaments united with the single style forming a column, anther 1 (in *Cypripedium* 2), situated on the apex of the column and just above or behind the stigma, which is a viscid surface facing the lip. Pollen agglutinated into 2 to 8 pear-shaped masses. Ovary inferior, commonly long and twisted, 1-celled. Fruit a 3-valved capsule. Seeds innumerable, minute.

Plants with green herbage.

Flowers few and showy; lip an inflated sac; stem leafy . . . 1. *CYPRIPEDIUM*.

Flowers in spikes or racemes.

Perianth with a spur 2. *HABENARIA*.

Perianth spurless.

Stem leafy.

Raceme loose with foliaceous bracts; flowers greenish or rose-color . . .

3. *EPIPACTIS*.

Spike dense and twisted; flowers white 4. *SPIRANTHES*.

Stem scape-like, the leaves in a radical cluster; flowers white

5. *GOODYERA*.

Flower solitary, showy; lip sac-like; leaf 1, basal 6. *CALYPSO*.

Plants reddish-brown, destitute of green herbage and the leaves reduced and scale-like 7. *CORALLORHIZA*.

1. *CYPRIPEDIUM*. LADY'S SLIPPER.

Stems leafy from tufted fibrous roots. Leaves large. Flowers few or solitary, large and showy, leafy bracted. Sepals spreading, in ours seeming as if only 2, the lateral completely or almost completely united into one under the lip, which is an inflated sac with the incurved margin auricled near the base. Column very short,

incurved, terminating in a disk-like stigma. Fertile anthers 2, on short filaments, one on each side of the column below the stigma; sterile anther conspicuous, roundish or ovate, situated on the upper side and over-arching the stigma. (Latin *Cypris*, *Venus*, and *pes*, a foot, the saccate lip a fit buskin for the goddess.)

1. *C. montanum* Dougl. Rough-pubescent with short glandular hairs, 1 to 2 ft. high; leaves elliptic- to narrowly-ovate, the largest 5 or 6 in. long and 3 in. broad; flowers 1 to 3, shortly pediceled; sepals and wavy-twisted petals linear-lanceolate, $1\frac{1}{2}$ to 2 in. long; lower sepals united almost to the apex, only the lanceolate-subulate tips free; lip 1 in. long, dull white, veined with purple; sterile anther ovate, 4 lines long, on a slender filament; capsule erect or nearly so, oblong, 10 lines long.

Woods, rare in our district and only near the coast from the Santa Cruz Mountains northward: Marin Co.; Skaggs Springs; Mendocino Co. (from the coast to Round Valley); Humboldt Co.; Sierra Nevada.

C. CALIFORNICUM Gray of Mendocino Co. and the northern Sierras has 3 to 6 flowers; sepals oblong, 6 to 7 lines long, the lower united to the apex; sterile anther rounded, nearly sessile.

2. *HABENARIA* Willd. REIN-ORCHIS.

Stems erect, leafy at least at base, solitary from fleshy tuber-like roots. Flowers greenish, yellowish, or white, in a terminal spike or raceme. Sepals equal, the lateral mostly spreading, the petals a trifle smaller. Lip spreading or drooping, in ours entire, produced at base into a long slender spur. Column very short. Anther-sacs more or less divergent. (Name from the Latin *habena*, a thong or rein of a horse, on account of the shape of the spur in some species.)

Flowers greenish; dry hills.

Lip ligulate; stems slender, naked, with 2 leaves at base . . . 1. *H. elegans*.

Lip triangular-ovate; stems cylindrical, leafy at base and with scale-like leaves above . . . 2. *H. Michaeli*.

Flowers white or whitish, fragrant.

Stem leafy; lip slender-lanceolate above the roundish base, much exceeding the sepals and petals; moist places . . . 3. *H. leucostachys*.

Stem leafy at base, scaly above; lip narrowly ovate, not exceeding the sepals or petals . . . 4. *H. maritima*.

1. *H. elegans* Bolander. WOOD REIN-ORCHIS. Stem slender, 10 to 20 in. high, with 2 (or sometimes 3?) leaves at base; leaves lanceolate or oblong-lanceolate, acuminate, 4 to 6 in. long, drying up or quite gone by flowering time; spike slender, rather dense but not crowded, 4 to 7 in. long; flowers small, light-green; bracts broadly subulate, acuminate, equaling the ovary; perianth segments $1\frac{1}{2}$ to 2 lines long; sepals oblong; petals and lip ligulate; spur filiform, 4 or 5 lines long, equaling or exceeding the ovary; capsule oblong, nearly sessile, 3 or 4 lines long.

Dry hillsides under oaks and other trees. Coast Ranges from Monterey to Berkeley; Marin Co.; Napa Co.; the Vaca Mountains; and Mt. Shasta. -June.

2. *H. Michaeli* Greene. Stem very thick and cylindrical, 1 ft.

high or less, leafy at base; cauline leaves triangular-ovate, thin, appressed, 4 to 9 lines long; spike rather dense, $2\frac{1}{2}$ to 3 in. long; sepals and petals similar, $1\frac{1}{2}$ to 2 lines long; lip triangular-ovate, of about the same length; spur fully $\frac{1}{2}$ longer than the ovary.

Under oaks in the hills south of Livermore, acc. to Greene; San Luis Obispo Co., G. W. Michael.

3. *H. leucostachys* Wats. SIERRA REIN-ORCHIS. Stem leafy, 16 to 22 in. high; leaves linear or lanceolate, 3 to 8 lines broad; flowers white, rather large, in a dense or open spike which is 4 to 8 in. long; bracts linear-subulate, exceeding the ovary; sepals oblong or oblong-ovate, 3 or 4-nerved, thin, 2 or 3 lines long; petals lanceolate; lip slender-lanceolate from a roundish-dilated base, much exceeding the sepals and petals; spur slender, 4 to 6 lines long; beak of the stigma prominent, ovate, more than half the length of the connective; capsule oblong, sessile, 6 to 9 lines long.

Common about springs and in moist meadows of the Sierra Nevada; Shasta region; Point Arena; attributed to the San Francisco Peninsula.

4. *H. maritima* Greene. Low and stout, 6 to 10 or 14 in. high; basal leaves oblong, acute, 3 to 6 in. long, $\frac{1}{2}$ to 1 in. wide, the lowest narrowed to a broad petiole; upper cauline leaves reduced, appressed, lanceolate-subulate; spike $1\frac{1}{2}$ to 4 in. long, slightly conical, 7 to 13 lines broad, the flowers white, with a heavy fragrance, closely crowded; sepals broadly oblong, obtuse, with a green midvein, a little exceeding 2 lines; petals 2 lines long, broadest at the base, ligulate-attenuate above; lip narrowly ovate, with a prominent ridge toward the base; spur slender, longer than the ovary; column short and almost beakless.

Sea cliffs of the San Francisco Peninsula (Fort Point and Point Lobos). July-Oct.

3. EPIPACTIS Haller.

Stem leafy from creeping rootstocks. Flowers in racemes with foliaceous bracts. Sepals and petals nearly equal, spreading; lip strongly constricted at the middle, the lower portion deeply concave, the upper portion dilated. Anther 2-celled, sessile behind the broad truncate stigma, on a slender jointed base; the pollen-masses become attached above to the gland capping the small rounded beak of the stigma. Ovaries reflexed at maturity.

1. *E. gigantea* Dougl. STREAM ORCHIS. Stout, 1 to 2 ft. high, nearly glabrous; leaves ovate below, lanceolate above, acute or acuminate, 3 to 7 in. long; raceme minutely pubescent; flowers 3 to 10, greenish or rose-color, on pedicels 2 lines long; sepals 7 lines long (exceeding the petals), the upper concave and somewhat carinate; petals rose-color, purple-veined, particularly the lip; lower portion of lip with short erect lobes or wings and with many callous tubercles near the base; upper portion ovate-lanceolate, crested or ridged towards the base; capsule oblong.

Moist stream banks from Santa Barbara to Mt. Diablo, Marin Co. (Nicasio, Taylorville), Cazadero, the Napa Mountains and northward. May 15-June.

4. **SPIRANTHES** Rich.

Stems from a cluster of tuberous roots, erect, leafy. Flowers white, spurless, in 1 to 3 rows in a twisted spike. Sepals and petals all narrow, erect, or more or less connivent. Lip sessile or with a short claw, the lower portion embracing the column and bearing a minute-callose protuberance on each side, the upper portion spreading and wavy-crisped. Column short, obliquely inserted on the ovary, bearing the stigma on the front and the sessile or short-stalked erect anther on the back. Capsule erect. (Greek *speira*, spiral, and *anthos*, flower, in allusion to the twisted inflorescence.)

Perianth 4 to 6 lines long; callosities at base of lip minute

Perianth 3 lines long; callosities at base of lip nipple-like and pointing downward 1. *S. Romanzoffiana*.
 2. *S. porrifolia*.

1. **S. Romanzoffiana** Cham. Glabrous, 5 to 16 in. high; leaves oblong-lanceolate, 3 to 7 in. long, 4 to 8 lines wide; spike dense, 3 in. long, the flowers in 3 ranks; bracts conspicuous, ovate, abruptly subulate-pointed, 5 or 6 lines long; perianth 4 to 6 lines long, curved, the sepals and petals connivent; lip recurved, broader at base, contracted below the narrower rounded summit; callosities smooth, often not obvious.

Wet meadows or marshy places in the mountains; Marin and Sonoma Cos. northward to Mt. Shasta; high Sierra Nevada. July-Aug.

2. **S. porrifolia** Lindl. Similar in habit to the preceding; stems 1 ft. high or more; flowers smaller and spike narrower; perianth 3 lines long; callous protuberances at base of lip nipple-like and pointing downward.

Little known species: Marin Co., acc. to Behr; upper Sacramento Valley on the eastern side, *Hartweg*.

5. **GOODYERA** R. Br. RATTLE-SNAKE PLANTAIN.

Scapes erect, bearing a few sheathing scale-like leaves, a terminal spike, and at base a cluster of petioled white-reticulated leaves. Rootstock creeping, with fleshy roots. Flowers white, similar to *Spiranthes*. Lateral sepals free, the upper one united with the petals into an erect galea. Lip sac-shaped, sessile, entire and without callous thickenings at base. Anther without a lid. (John Goodyer, British botanist.)

1. **G. Menziesii** Lindl. Plants 11 to 15 in. high, glandular-pubescent, especially the scapes and inflorescence; leaves thickish, rosulate, oblong-ovate, acute at both ends, reticulated with white or light-colored veins or markings, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long, on petioles $\frac{1}{2}$ to $\frac{3}{4}$ in. long; flowers 3 or 4 lines long; spike about 5 in. long.

Woods near the coast from Marin Co. (Lagunitas Creek and Bear Valley near Olema) northward; Shasta Springs; Sierra Nevada. July-Aug.

6. **CALYPSO** Salisb.

Low herb with a corm and coral-like roots. Stem scape-like,

1-flowered, sheathed by a few scale-like leaves and with a single petioled leaf at base. Flowers large, showy, terminal, bracted. Sepals and petals similar and equal; lip sac-like, with 2 short spurs below the expanded apex. Column broadly winged, almost oval, concave, and petal-like; anther hemispherical, borne just below the summit, opening by a lid. (Named for the nymph Calypso in Homer.)

1. *C. borealis* Salisb. CALYPSO. Stem 4 or 5 in. high, the sheathing scales 1 to 2 in. long; leaf ovate, cordate or truncate at base, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long; petioles $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; flower on a drooping pedicel; sepals and petals rose-purple, sometimes pale, linear-lanceolate, 9 lines long; lip as long or slightly longer, ovate-inflated, reddish-brown and mottled, the terminal expanded portion with 3 hairy ridges at base running towards the spurs.

Bogs or in leaf-mold in the redwood forests from Mt. Tamalpais and Cazadero to Mendocino Co. and northward along the coast. Mar. Flowers resembling those of the Lady's Slipper.

7. CORALLORHIZA R. Br. CORAL-ROOT.

Brownish or yellowish saprophytes or parasites, destitute of green herbage, and with branching toothed coral-like roots. Stem scape-like, the leaves reduced to scales, and bearing the flowers in a terminal raceme. Perianth segments oblong or lanceolate, nearly alike, ours 3-nerved. Lateral sepals united at base with the foot of the column, forming a short spur which is adnate to the summit of the ovary. Lip 1 to 3-ridged. Column 2-edged, slightly incurved. Anther terminal, opening by a lid. Pollen-masses 4, soft-waxy. Capsules reflexed. (Greek korallion, coral, and rhiza, root.)

Perianth 3 or 4 lines long, the lateral sepals spurred at base; lip 3-lobed, the middle lobe largest 1. *C. multiflora*.
Perianth 6 lines long; spur none; lip entire 2. *C. Bigelovii*.

1. *C. multiflora* Nutt. Stems 8 to 13 in. high; raceme 2 to 4 in. long; flowers whitish, tinged or veined with purple; sepals and petals 3-nerved, 3 or 4 lines long; lateral sepals united at base with the foot of the column forming a short (1 line long) spur which is adnate to the ovary; lip mostly purple, broadly ovate and somewhat convex, 3-lobed by a deep cleft on each side; lateral lobes narrow and acutish; middle lobe large and rounded or notched with involute or denticulate margin; raceme loose, 3 to 10 in. long; capsules $\frac{3}{4}$ in. long.

Shade of woods in the seaward or middle Coast Ranges: Oakland Hills; Mt. Tamalpais; Mt. St. Helena.

2. *C. Bigelovii* Wats. Stems 12 to 15 in. high, with 3 or 4 sheathing leaves; sepals and petals somewhat flesh-colored, striately 3-nerved with purple or reddish-brown lines, about 6 lines long; lateral sepals oblique; lip quite entire; base of the column (opposite lip) prominently gibbous over the ovary; capsule 6 to 9 lines long.

Mountain woods of the Sierras and along the coast.

DICOTYLEDONS.

Vascular bundles arranged in a circle around a central pith, the stem when perennial increasing in size by means of a cambium ring. Leaves with netted veins. Parts of the flower commonly in fours or fives. Embryo with 2 cotyledons.

CHORIPETALÆ.

Corolla present or absent; when present consisting of distinct petals.

14. SALICACEÆ. WILLOW FAMILY.

Trees and shrubs with simple alternate stipulate leaves. Flowers diœcious, arranged in aments (catkins), these falling off as a whole, the staminate after anthesis, the pistillate after the ripening of the fruit and dispersion of the seeds. Bracts of the ament scale-like. Perianth none. Stamens 1 to several. Ovary 1-celled; stigmas 2. Fruit a 2-valved capsule, enclosing many seeds furnished with a tuft of hairs at base.

Bracts entire or merely denticulate; flowers without disk; stamens in ours 1 to 5; stigmas short 1. *SALIX*.
Bracts fimbriate or lacerate; flowers with a broad disk; stamens numerous; stigmas elongated, conspicuously dilated 2. *POPULUS*.

1. *SALIX* L. WILLOW.

Leaves mostly narrow, short-petioled. Buds covered by a single scale. Aments (catkins) mostly erect, appearing before or with the leaves; bracts entire or merely denticulate. Stamens (in our species) 1 to 5, accompanied by 1 or 2 little glands. Pistillate flowers with a gland at the base of the ovary. Stigmas short. (Classical Latin name of the Willow.)

Stamens 3 or more; aments terminal on leafy branches; bracts of the pistillate ament pallid or greenish, falling before the fruit matures; bark of trunks rough and fissured; leaves serrulate; trees.

Petioles not glandular.

Leaves narrowly lanceolate, long pointed, green on both surfaces; stipules semi-cordate, acuminate, sometimes deciduous 1. *S. nigra*.

Leaves lanceolate or oblong-lanceolate, acute or acuminate, pale or glaucous beneath; stipules commonly none 2. *S. lævigata*.

Petioles glandular near the blade; leaves lanceolate, long-pointed, often pale or glaucous beneath; stipules semi-orbicular, mostly conspicuous 3. *S. lasiandra*.

Stamens 2, rarely 1; bark smooth.

Aments terminal on short leafy branchlets; bracts pallid, often falling before the ament matures; leaves linear to linear-lanceolate, entire or serrulate; occurring mostly as shrubs in our district.

Leaves silky pubescent on both surfaces; stigmas large, sessile 4. *S. fluviatilis*
var. *argyrophylla*.

Leaves green on both surfaces and more or less glabrous; style short but obvious; stigmas linear 5. *S. sessilifolia*.

Aments terminating very short leafless lateral branchlets; bracts dark-colored at apex, persistent in fruit; bark smooth; leaves entire; small trees or shrubs.

Leaves oblong to oblanceolate, pale or gray-pubescent beneath; ovary and capsule glabrous 6. *S. lasiolepis*.

Leaves obovate or oblong-obovate to oblanceolate and

Pubescent beneath, at maturity glabrate; pistillate aments oblong, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; stigmas divided into 2 linear lobes 7. *S. Nuttallii*
var. *brachystachys*.

Lustrous-silky beneath; pistillate aments slender, 2 in. long; stigmas oblong, entire or nearly so 8. *S. Stichenis*.

1. ***S. nigra* Marsh. BLACK WILLOW. RIVER WILLOW.** Tree 20 to 30 ft. high; bark rough and dark; branchlets brittle at the base; mature leaves lanceolate or linear-lanceolate, long-pointed, often falcate, serrulate, 4 to 6 in. long, on petioles $\frac{3}{4}$ in. long, green on both surfaces; stipules semi-cordate, acuminate or minute or early deciduous; aments (catkins) becoming rather lax; bracts obovate, yellow, more or less villous below the middle, sometimes slightly dentate; stamens 3 to 5; ovary ovate; capsule reddish-brown.

River and slough banks of the Sacramento and San Joaquin.

2. ***S. lævigata* Bebb. BEBB WILLOW.** Tree 30 to 40 ft. high; branchlets one winter old reddish-brown; young leaves mostly oblong, disposed to be broadest above the middle, but very variable, entire, soon becoming serrulate; stipules small and caducous or represented by minute glands; mature leaves lanceolate to oblong-lanceolate, serrulate, green and shining above, pale or conspicuously glaucous beneath, 4 in. long, nearly 1 in. to $1\frac{1}{4}$ in. broad, on petioles 4 lines long, the smaller oblong, $1\frac{1}{4}$ in. long, all mucronate; staminate aments erect or pendulous, commonly flexuous, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long; bracts closely imbricated, more or less elliptic, woolly at base, glabrous and pallid towards the apex, 2 to 4-toothed at apex; stamens 5 or 6, elongating after dehiscence begins, less than twice the length of the bracts when fully grown; anthers chrome-yellow; filaments hairy below; capsule brown, 2 to $2\frac{1}{2}$ lines long.

Coast Ranges: Berkeley; York Creek, St. Helena; Howell Mt. Sierra Nevada. Mar. 15-Apr. Dr. Anderson of Santa Cruz calls this "Spotted-leaf Willow."

3. ***S. lasiandra* Benth. WESTERN BLACK WILLOW.** Tree 30 to 45 ft. high, the trunk with brown roughly fissured bark; branchlets one winter old yellowish; young leaves mostly lanceolate, glandular-serrulate with suborbicular stipules; petioles glandular at the upper end; mature leaves lanceolate with long tapering point, 4 to 7 in. long, $\frac{3}{4}$ in. wide; stipules on vigorous shoots conspicuous, 5 to 12 lines broad; aments (catkins) on leafy peduncles; staminate aments $1\frac{1}{4}$ to 3 in. long, straight; bracts thin, oblong, nearly or quite glabrous on the back, hairy at base, entire or often minutely toothed at the acute apex, $1\frac{1}{2}$ lines long; stamens 5 or 4, anthers pale-yellow; pistillate aments $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; bracts acute, mostly minutely toothed; pistil pedicellate; capsule reddish-yellow, 3 lines long.

A common tree on river banks and along creeks and ravines, commonly associated with *S. lasiolepis* but, unlike that, rarely deserting living streams. Mar. Staminate bracts often reddish-brown on the back at apex; stamens varying from 5 to 9 acc. to Sargent.

4. *S. fluviatilis* Nutt. var. *argyrophylla* (Sarg.). SAND-BAR WILLOW. Shrub, 4 to 8 ft. high; leaves linear, acute or acuminate, 2 to 3 in. long and 1 to 2 lines wide, sessile or nearly so, lustrous-silky when young, more or less glabrate in age, entire or obscurely denticulate; stipules early deciduous; aments (catkins) linear, borne on lateral leafy branchlets of the season, often clustered; bracts yellowish, villous, deciduous; capsule shortly pediceled, usually tomentose; stigma large, sessile.—(*S. longifolia* Muhl. of Bot. Cal.)

Very common in beds of arroyos and rivers, forming dense clumps on sand and gravel bars. Lower Sacramento; Alameda Co., etc.

5. *S. sessilifolia* Nutt. Very similar to the last; leaves narrowly lanceolate, green on both surfaces, pubescent or more or less glabrous; stipules acute; bracts oblanceolate, villous; capsules mostly tapering to a beak, sessile or nearly so, densely pilose when young; style short but distinct; stigmas deeply bifid with linear lobes.

Very common along rivers and in stream beds, in the Coast Ranges and Sacramento Valley.

6. *S. lasiolepis* Benth. ARROYO WILLOW. Shrub or tree, 10 to 18 ft. high; mature leaves oblong or slightly broadest above the middle, obscurely serrulate, dull green above, gray pubescent beneath, $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, 2 to 3 in. long on petioles 2 to 5 lines long; aments appearing before the leaves, densely silky tomentose in the bud, suberect; staminate aments $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, stamens 2; pistillate aments 1 in. long or less, in fruit 2 in. long or somewhat more.

Coast Ranges and Lower Sierras: the most common willow, filling river and creek beds and following dry gulches to their sources in the hills. Feb.

7. *S. Nuttallii* Sarg. var. *brachystachys* Sarg. Tree 25 ft. high with a trunk $\frac{3}{4}$ to $1\frac{1}{2}$ ft. in diameter or a shrub only 4 to 8 ft. high; the branchlets commonly with very dark bark; leaves broadly obovate or oblong-obovate, 1 to $1\frac{1}{2}$ in. long; staminate aments $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, its bracts obovate, rounded, black or black-tipped, hairy-pubescent, those of the female flower similar; stamens 2, long exserted; pistillate aments oblong, $\frac{1}{2}$ to $\frac{3}{4}$ in. long or in fruit $1\frac{1}{2}$ in. long; ovary short-silky; stigmas divided into linear lobes, seeming as if 4; capsule less silky than the ovary.—(*S. flavescens* Nutt.)

Coast Ranges near the coast, on mountain sides. Flowering in winter. In the Oakland Hills it grows in clumps about springs or in moist hollows on north slopes, and is very straggling and ancient looking. The author is indebted to Mr. Harry A. Dutton of Stanford University for a note on its occurrence as a tree in the Santa Cruz Mountains.

8. *S. Sitchensis* Sanson. VELVET WILLOW. Arborescent or shrubby, 15 to 25 ft. high; leaves oblong-ovate to oblanceolate, acute or rounded at apex, cuneate at base, densely tomentose and lustrous-silky beneath, dark-green and almost glabrous above, 2 to 4 in. long, sometimes, especially toward the south, very thick and leathery; staminate aments slender, white or silky with very long hairs which

at first quite conceal the body of the ament; stamens 1 or 2; bracts spatulate, rounded at apex, yellowish or pallid; pistillate aments very slender as compared with the last species, 2 in. long or in fruit 3 in. long; bracts somewhat shorter and broader than in the staminate, more acute; stigmas short-oblong, entire or nearly so.

Along stream banks, from Santa Barbara to Wright's, Santa Cruz Mountains; Lagunitas Creek, Marin Co. and northward. Mar.

2. *POPULUS* L. POPLAR.

Trees with scaly buds and caducous stipules; leaves long-petioled, broad. Aments (catkins) appearing before the leaves, in ours pendulous, sessile or nearly so; bracts fimbriate or lacerate, caducous. Stamens inserted on the surface of a concave, often oblique, disk. Ovary more or less surrounded by a disk; style short, stigmas 2 to 4, narrow and elongated or in ours conspicuously dilated. Capsule 2 to 4-valved. Coma of the seeds usually very long and conspicuous. (Classical Latin name of the Poplar.)

Leaves deltoid-orbicular, broader than long, green or yellowish-green, alike on both faces 1. *P. Fremonti*.

Leaves longer than broad, ovate, green above, rusty or silvery beneath 2. *P. trichocarpa*.

1. *P. Fremonti* Wats. COMMON COTTONWOOD. Tree 30 to 50 ft. high with a broad crown of wide-spreading branches; young twigs straw-colored; leaves deltoid-orbicular, broader than long, the margin crenate or sinuate-crenate but entire at the abruptly short-pointed (or rarely obtuse) apex and at the truncate or subcordate base, 2 to 4 in. broad, $1\frac{1}{2}$ to 3 in. long, green or yellowish-green on both surfaces; staminate aments 1 to $1\frac{1}{2}$ in. long, densely flowered, stamens on an entire disk, 60 to 80, with dark red anthers; pistillate aments 2 in. long, loosely flowered; ovary crowned with three roundish stigmas and surrounded at base by a membranaceous disk which is persistent under the capsule; fruiting aments 4 or 5 in. long; capsules on pedicels 2 lines long, ovate, obtuse, minutely rough-tuberculate or transversely ridged, 4 to 5 lines long, 3 or 4-valved; seeds 1 line long, with an abundance of long white hairs which cover the mature ament with a dense soft cottony mass.

Common in interior valleys, along creeks and rivers, throughout California; not seen in the seaward or middle North Coast Ranges within our limits.

2. *P. trichocarpa* Hook. BLACK COTTONWOOD. Tree 20 to 30 ft. high with a rather broad head of upright branches; leaves ovate or broadly oblong-ovate, round at base, acute at apex, serrulate, dark-green and shining above, rusty or silvery beneath, 2 to $3\frac{1}{2}$ in. long on petioles 1 or $1\frac{1}{2}$ in. long or less; staminate aments 1 to $1\frac{1}{2}$ in. long, stamens on an oblique disk 40 to 60, with light-purple anthers; pistillate aments loosely flowered, $2\frac{1}{2}$ to 3 in. long; ovary crowned by three dilated deeply lobed stigmas; fruiting ament 4 to 5 in. long; capsule nearly sessile, 3-valved; seed 1 line long, with long lustrous white hairs.

Sierras at considerable elevations. An infrequent tree in the Coast Ranges of middle California: Mitchell Cañon, Mt. Diablo; San Leandro Creek; Carnadero Creek, near Gilroy, *Jepson*; no other localities in the Bay Region hitherto recorded; noted near the Mountain House on the Round Valley road from Ukiah and at occasional stations northward but rarely. Winter buds over $\frac{1}{2}$ in. long, very slender and long-pointed. Sometimes called "Balsam Cottonwood."

P. TREMULOIDES Michx., the Aspen of the High Sierras, has round-ovate leaves, crenulate or almost entire, abruptly acuminate, 1 to $1\frac{1}{2}$ or 2 in. long; 7 to 10 stamens; and linear stigmas.

15. BETULACEÆ. BIRCH FAMILY.

Trees or shrubs with alternate petioled simple leaves, caducous stipules, and small flowers in linear or elongated clustered aments. Staminate aments pendulous, the flowers in clusters of 3 in the axil of each bract, consisting of a membranous 4-parted calyx and 2 to 4 stamens. Pistillate aments much smaller, erect, spike-like, the flowers 2 in the axil of each bract, without perianth, consisting of a pistil with two styles and a 2-celled ovary with 1 ovule in each cell; fruit a small compressed 1-seeded nut which is margined or winged.

1. ALNUS L. ALDER.

Our trees with toothed leaves and aments which appear in the autumn of the year previous to their flowering and pass the winter naked. Bracts of the staminate ament dilated above with the apex abruptly upturned, each covering 4 bractlets. Pistillate aments woody and cone-like when mature, the bracts and bractlets united and persistent. (So called on account of the trees growing along streams, the name derived from the Celtic through the Latin.)

Bracts of staminate ament acute; stamens 4 1. *A. Oregana*.

Bracts of staminate ament obtuse; stamens 2 to 4 2. *A. rhombifolia*.

1. *A. Oregana* Nutt. RED ALDER. Tree 30 to 45 ft. high, the limbs long and straight and the ultimate branchlets mainly few; trunk usually $\frac{1}{2}$ to $1\frac{1}{2}$ ft. in diameter, gray or almost white and often mottled; leaves broadly ovate, 2 to 6 in. long, more or less pubescent and often rusty beneath; the margin irregularly serrulate and sometimes more or less revolute, the teeth callous-tipped and mostly triangular or blunt; staminate aments 3 to 5 in. long; bracts acute; stamens 4, filaments less than 1 line long, the anthers brick-red; pistillate aments 6 lines long; cones oblong-ovate, $\frac{3}{4}$ to 1 in. long; bracts with the apices turned abruptly upward and, therefore, slightly tabular at summit; nutlets winged, 1 line long.—(*A. rubra* Bong.)

Bottoms of cañons along streams in the Coast Ranges throughout the State. Feb.—Mar.

2. *A. rhombifolia* Nutt. WHITE ALDER. Tree 20 to 35 ft. high with trunk of a light-gray or ashy color, mottled with large blotches, the limbs often ultimately much branched and becoming

finely twiggy; leaves narrowly or broadly ovate to elliptic, 1 to 4 in. long, serrulate as in the last, but the teeth narrower and often salient, or else very low; staminate aments 3 to 4 in. long, more slender than in the preceding; bracts obtuse; filaments often more than 1 line long; pistillate aments 2 or 3 lines long; cones broadly oblong, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the bracts with a straight or only slightly upturned point; seeds slightly larger than in the last, acutely margined.

Sierra Nevada, and from the banks of the Sacramento River westward through the Coast Ranges to the ocean. Jan.—Feb. Our only other species, *A. tenuifolia* Nutt., forms shrubby thickets at 6,000 to 7,000 ft. altitude in the Sierras.

In the genus *Betula*, the stamens are 2 with forked filaments (each fork bearing an anther cell); the bracts in the pistillate ament fall from the axis when the cone is ripe, and the nutlet is broadly winged.

B. OCCIDENTALIS Hook., Western Birch; leaves $\frac{1}{2}$ to $1\frac{1}{2}$ in. long.—High Sierras and Humboldt Co. northward to Siskiyou Co.

B. GLANDULOSA Michx.; a low bush with leaves $\frac{1}{2}$ to 1 in. long.—Plumas Co. and northward.

16. CORYLACEÆ. HAZEL FAMILY.

Shrubs or bushes with alternate simple leaves. Staminate flowers in aments without perianth. Pistillate flowers in a short spike, 2 to each bract and with small bractlets which become much enlarged and foliaceous, forming a tubular involucre enclosing the nut.

1. CORYLUS L. HAZEL.

Leaves broad, thin, serrulate or incised. Staminate aments (catkins) pendent, cylindrical, single or fascicled, from scaly lateral buds, the pistillate clusters of flowers terminal and lateral on the same branchlets. Flowers appearing before the leaves. Staminate flower consisting of 4 (seemingly 8) stamens with forked filaments, each fork bearing one cell of an anther, the undivided portion of the filament cohering more or less with the inner face of the scale or bract of the ament. Pistillate flowers several in a scaly bud, two to each bract, each flower with a posterior and anterior bractlet, these very small but conspicuously laciniate-fringed; perianth minute, adnate to the ovary and without limb; style short; stigmas elongated and slender. Nut ovoid or oblong, large, bony, enclosed in a leaf-like involucre formed of the enlarged bractlets. (Name said to be from *korus*, a helmet, in reference to the involucre.)

1. *C. rostrata* Ait. var. *Californica* A. DC. CALIFORNIA HAZEL. Commonly 6 to 10 ft. high; leaves broadly obovate, ovate or oval, glandular-pubescent or villous, $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long; bract or scale of the ament with its terminal portion abruptly turned upward; filaments, save for the forked portion, obsolete or not evident, so that the stamens are apparently 8 instead of 4; anthers with a sparse tuft of hairs at apex; involucre densely hispid, prolonged beyond the nut into a laciniately-fringed beak 1 in. long; nut 6 lines long.

Common in the hills, especially along streams. Feb.—Mar. The staminate aments appear as early as Sept. of the year preceding anthesis.

17. CUPULIFERÆ. OAK FAMILY.

Trees or shrubs with alternate and simple leaves and promptly deciduous stipules. Flowers monœcious, apetalous, appearing with the leaves in deciduous species. Staminate flowers in aments (catkins); stamens 4 to 12 in the 4 to 6-parted calyx. Pistillate flowers solitary or spicate; calyx adherent to the 3-celled 6-ovuled ovary, the minute teeth crowning the summit; ovary or ovaries surrounded by an involucre which forms a cup furnished externally with scales or spines. Fruit a 1-celled 1-seeded nut or acorn, only one ovule maturing, the remaining ovules and the other two cells abortive.

Involucre 1-flowered, becoming a scaly cup. 1. QUERCUS.
Involucre 1 to 3-flowered, becoming a spiny bur. 2. CASTANEA.

1. QUERCUS L. OAK.

Trees, or sometimes low shrubs, with greenish or yellowish flowers. Staminate aments slender and naked, pendulous (in one species erect), one or several from a scaly bud of the previous season; bracts caducous; calyx 2 to 8-parted or lobed; stamens variable, 3 to 12. Pistillate flowers solitary or somewhat scattered, borne on shoots of the season, consisting of an ovary with 3 (4 or 5) styles or sessile stigmas, surrounded by a scaly involucre which becomes the woody cup of the fruit. Seed with thick fleshy cotyledons; rudiments of the 5 remaining ovules often discernible at the base or top of the nut. (Latin name of the Oak.)

Staminate aments pendulous, borne below the pistillate; filaments not longer than the anthers; stigmas dilated.

Bark pale, wood nearly white; stamens mostly 6 to 9; stigmas sessile or nearly so; abortive ovules mostly basal.—WHITE OAKS.

Acorns maturing the first year, the nut glabrous on the inner surface.

Trees; leaves deeply or shallowly sinuate-pinnatifid, falling in the autumn, their lobes or teeth obtuse, rarely bristle-pointed.

Calyx-lobes ovate, acute; nut conical, elongated, $1\frac{1}{4}$ to 2 in. long. 1. *Q. lobata*.

Calyx-lobes laciniately cut.

Nut oval or oblong, 1 to $1\frac{1}{4}$ in. long; leaves mostly 4 to 6 in. long. 2. *Q. Garryana*.

Nut broadly oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; leaves mostly 2 to 3 in. long. 3. *Q. Douglasii*.

Shrub; leaves not lobed, persisting until after the appearance of those of the following year. 4. *Q. dumosa*.

Acorns maturing the second year, the nut tomentose on the inner surface; evergreen trees or shrubs; leaves oblong, entire, or spinose-dentate. 5. *Q. chrysolepis*.

Bark dark, wood reddish; stamens 4 to 6; stigmas on long styles; inner surface of nut silky-tomentose; abortive ovules toward the top of the fruit.—BLACK OAKS.

Acorns maturing the first year, ovate, elongated; leaves persisting until the appearance of those of the following year in Mar. and Apr. 6. *Q. agrifolia*.

Acorns maturing the second year.

Leaves mostly oblong, dentate or entire, persistent until the second summer or autumn; nut slender, tapering. 7. *Q. Wislizenii*.

Leaves sinuate-pinnatifid, the teeth bristle-pointed, falling in the autumn; nut oblong, obtuse 8. *Q. Californica*.
 Aments erect and androgynous (with the pistillate flowers at base and the staminate flowers above), or wholly staminate; filaments several times longer than the small anthers; stigmas linear; fruits maturing in the second year; evergreen tree. 9. *Q. densiflora*.

1. *Q. lobata* Née. VALLEY OAK. A graceful tree commonly 40 to 60 ft. high, in typical form broader than tall, with long pendulous branches sometimes sweeping the ground; leaves oblong or obovate, shallowly or deeply sinuate-pinnatifid with entire or toothed lobes, green and nearly glabrous above, pale beneath with a fine close indument and conspicuously yellow-veined, $2\frac{1}{2}$ to 4 in. long; staminate aments 2 to 3 in. long, the calyx-lobes 6 to 8, externally pubescent, stamens 8 or 9; pistillate flowers mostly solitary and sessile; acorns sessile or subsessile; mature nut long-conical, $1\frac{1}{4}$ to 2 in. in length, at first bright-green, later chestnut-brown; cup deep-hemispherical, strongly tuberculate.

The largest and most beautiful West-American oak, sometimes 80 to 100 ft. high and 8 to 20 ft. in trunk diameter. The main stem commonly divides into several wide-spreading branches, which form a broad head with graceful drooping sprays. The bark is dark brown to ashen-gray and is very deeply fissured into narrow plates. This tree, which won the unreserved admiration of all early travelers, is the most characteristic oak in the fields and along the water courses of the Coast Range and interior valleys. "Roble" of the Spanish-Californians. Apr. Fr. Oct.

2. *Q. Garryana* Hook. PACIFIC POST OAK. Tree 30 to 70 ft. high; branches not drooping but rigid and more tomentose-pubescent; leaves oblong-obovate 4 to 6 in. long, cuneate or rounded at base, shallowly sinuate-pinnatifid, the lobes coarser than in the last; calyx-lobes of the staminate flowers laciniately cut, slightly ciliate; acorns sessile or short-pedunculate; nut oval or slightly obovate, often ventricose, 1 to $1\frac{1}{4}$ in. in length; cup shallow, cup-shaped or turbinate, its scales thin and free or at base thickened and united.

In the mountains at lower or middle elevations from Santa Cruz and Sonoma Cos. northward; a rare tree within our limits, but abundant in northwestern California.

3. *Q. Douglasii* H. & A. BLUE OAK. MOUNTAIN WHITE OAK. Tree usually 20 to 30 ft. high with round-topped head; leaves obovate to oblong or oval, bluish-green above, mostly yellowish and pubescent beneath, with deep or shallow sinuses, the lobes commonly increasing in size from the base upwards or nearly entire, or sometimes with spinescent margin, cuneate or rounded at base, mostly 2 to 3, rarely 5 in. long; staminate aments about 1 in. long, the calyx yellow or green, the segments laciniately cut, stamens about 9; acorns sessile or short-peduncled; nut broadly oval, often ventricose, $\frac{3}{4}$ to 1 or $1\frac{1}{2}$ in. long, or ovate-acute, 1 to $1\frac{1}{2}$ in. long and very narrow; cup very shallow, thin, with flat or tubercled scales.

Throughout middle California; most abundant on the dry foothills of the Coast Ranges, especially towards the interior, rarely found on

the higher mountain slopes or in the valleys. It is exceedingly variable in the size, outline and lobation of the leaflets, but may be recognized even at a distance by the characteristic blue color of the foliage whence the common name by which it is most generally known. The species was first collected by David Douglas, a successful and indefatigable Scotch botanist and explorer who visited California in 1832.

4. *Q. dumosa* Nutt. SCRUB OAK. Shrub 5 to 6 ft. high with pale gray bark and tomentose branchlets; leaves coriaceous, broadly or narrowly oblong, 1 in. long more or less, spinose-serrate and sometimes sinuate or irregularly incised; staminate aments 3 in. long; acorns 2 together or solitary; nut oval, mostly pointed, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; cup hemispherical, strongly tuberculate at base, scales free above with minute hairy tips.

Common in the higher Coast Ranges south of San Francisco Bay. One of the shrubs of the "chaparral." First collected by Nuttall near Santa Barbara.

Var. *bullata* Engelm. Mostly 3 to 4 ft. high; leaves thicker, rounder, spinescent, but often entire with strongly revolute margins; nuts obtuse, cups shallower.—North Coast Range (Knoxville grade; upper Conn Valley, Napa River Basin, and elsewhere), rare south of San Francisco Bay.

5. *Q. chrysolepis* Liebm. MAUL OAK. Tree 30 to 40 ft. high, or on exposed mountain summits a shrub 4 to 10 ft. high (in such situations often gregarious); leaves oblong or narrowly-ovate to elliptical, cordate to cuneate at base, acute or cuspidate at apex, mostly entire on old trees, spinose-dentate on young ones or on vigorous shoots, pale and glaucous above, fulvous-tomentose or gray-pubescent below, at length glabrate; staminate aments 2 to 4 in. long, the calyx with 4 to 7 ovate, acute lobes; acorn usually solitary; nut oval or ovate, $\frac{1}{2}$ to 2 in. long; cup shallow, the tubercles and scales almost completely concealed by a close dense tomentum.

High ridges and cañon-walls of the Coast Ranges; Sierra Nevada. Sometimes called "Gold Leaf Oak," from the color of the tomentum on the under surface of the leaves. First collected by Hartweg near Monterey in 1846.

6. *Q. agrifolia* Née. FIELD OAK. ENCINA. Tree with very broad low top, 20 to 40 ft. high; on exposed hilltops a small shrub a few ft. high, with dark-brown bark; leaves oblong to oval or orbicular, entire or sinuate-dentate with spinose teeth, 2 to $2\frac{1}{2}$ in. long; staminate aments with the calyx deep-red, at length fading; styles 3, 4 or 5; nut ovate, elongated, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; cup turbinate, scales thin and membranaceous.

From Mendocino Co. southward; very common about San Francisco Bay. The trunk usually divides a few feet above the ground into very wide-spreading branches, which at their extremities often rest on the ground. Sargent says of this species, "The valleys and low hills of the California coast owe their greatest charm to this oak tree, which dotting their covering of vernal green or their brown

summer surface with its low, broad heads of pale contorted branches and dense dark foliage, gives them the appearance of incomparably beautiful parks." The leaves fall in Mar. and Apr. The flowers appear in late March or early Apr. First collected by one of the ship's officers of the Malaspina Expedition, which visited Monterey in 1791.

7. *Q. Wislizenii* A. DC. LIVE OAK. A tree 25 to 40 ft. high, in the mountains a mere shrub 4 or 5 ft. high; leaves broadly oblong, mostly acute at apex, varying to lanceolate, mostly 1 to 1½ in. long, entire, or serrate with spinulose teeth; calyx of staminate ament with about 5 shallow lobes, these glabrous, except the ciliate margins; stamens 6, sometimes 7 or 5; nut slender, oblong, or elongated-conical, somewhat acute, 1 to 1½ in. long; cup turbinate or nearly tubular, 6 lines deep; scales of the cup thin, with free tips, oblong, or ovate, closely imbricated, mostly pubescent, or glabrous and the innermost ciliate.

Coast Range valleys and foothills, more particularly away from the sea, usually reaching its best development along streams, in the higher mountains reduced to a low shrub, and sometimes a half-hearted associate of the shrubs of the chaparral. The aments from a terminal bud or a cluster of buds are often so numerous and in such profusion as to transform the appearance of the tree in April or May, imparting to the crown a singularly soft and half-billowy yellow-green appearance. First discovered by Fremont in the Sierra Nevada, but described from specimens collected by Dr. F. A. Wislizenius, on the American River.

8. *Q. Californica* Cooper. BLACK OAK. KELLOGG OAK. Tree 18 to 30 ft. high, taller than broad, the trunk dividing into mostly erect branches; leaves when young white-tomentose beneath, more or less pubescent above, in age glabrate, dark-green and shining above, yellowish-green below, or the tomentum on the lower surface persisting, oblong or elliptic to broadly obovate in outline, parted by sinuses into 5 to 7 lobes, these repand-dentate at apex, with bristle-pointed teeth, or entire, 2½ to 4 or 7 in. long; staminate aments 2 to 3 in. long, the calyx 5 (or 4)-lobed with the lobes hairy-pubescent on the outside; stamens 5 to 7, anthers at first bright-red, on dehiscence yellow; pistillate flowers in the upper axils of the young shoots, 2 flowers in a cluster; acorn solitary; nut broadly oblong, obtuse, 1 in. long; cup deeply hemispherical with lanceolate or broadly-ovate thin nearly glabrous scales.—(*Q. Kelloggii* Newberry.)

A common tree in the foothills and valleys of western middle California or occasionally met with (and usually in a small form) on high montane ridges. Mar. First discovered by Hartweg near Sonoma in 1846. The leaves in some cases are sparingly-lobed or toothed or almost entire. The young leaves are often conspicuously dark-red or purple. In some instances the scales at base of cup are tuberculate.

9. *Q. densiflora* H. & A. TAN-BARK OAK. Becoming a large

tree, 20 to 60 ft. high, the trunk 2 to 5 ft. in diameter; leaves oblong to elliptic-oblong, 2 to 4 or 5 in. long, 1 to 1½ in. wide, serrate or entire, rather densely tomentose when young; nerves conspicuous, parallel; aments 3 to 5 in. long, tomentose; stamens about 10; cup shallow, 8 to 13 lines wide, covered with linear or subulate spreading or recurved scales; nut oval, $\frac{3}{4}$ to 1¼ in. long, densely tomentose within, at first tomentose without.

South Coast Ranges near the sea; North Coast Ranges from the coast eastward to the Napa Mountains.

2. CASTANEA L. CHESTNUT.

Low stout shrubs or tall trees, ours with evergreen leaves, alternate. Flowers monœcious, in erect, unisexual or androgynous aments. Staminate calyx 5 to 6-parted, the lobes imbricated in æstivation; and the stamens mostly twice as many. Pistillate flowers 1 to 3 in a scaly involucre; calyx adherent to the 3-celled ovary; styles 3. Nuts 1 to 3, enclosed in an involucre which is covered with stout branched spines. (Greek *castanea*, the Chestnut.)

1. *C. chrysophylla* Dougl. CHINQUAPIN. Shrubby, 4 to 8 ft. high; leaves lanceolate or oblong, mostly narrow at both ends, entire, 2 to 6 in. long; aments staminate and androgynous, 2 to 2½ in. in length, crowded at the ends of the branchlets; staminate flowers 3 in the axils of the ovate bracts; pistillate clusters 1, 2 or 3, at the base of some of the lower aments; staminate calyx with a minute abortive ovary, 5 or 6-lobed, the lobes shorter than the stamens; pistillate calyx oblong-campanulate, shortly lobed and with minute abortive stamens; fruit ripening the second season; involucre irregularly 4-valved; seed edible.—(*Castanopsis chrysophylla* A.DC.)

A low shrub in the Sierra Nevada and on the Coast Ranges about San Francisco Bay (Mt. Tamalpais, Oakland Hills, Mt. St. Helena), often forming thickets; in northwestern California, near the coast, becoming a massive tree 150 ft. high.

18. JUGLANDACEÆ. WALNUT FAMILY.

Trees with alternate pinnate leaves, no stipules and monœcious apetalous flowers. Staminate flowers in lateral pendulous aments with an irregular calyx, and several to many stamens. Pistillate flowers terminal, 1 to several in a cluster, the 3 to 5-lobed calyx adherent to the ovary; styles 2, stigmatic along the inside. Nut of the fruit incompletely partitioned, containing a single oily seed, its exterior covered with a green and fleshy or at length dry and brown husk. Endosperm none.

1. JUGLANS L. WALNUT.

Bark aromatic and strong-scented, the branchlets hollow, chambered by pithy plates; buds nearly naked, axillary and superposed. Leaves odd-pinnate with numerous leaflets, deciduous. Staminate flowers from wood of the preceding season; calyx irregularly 3 to

6-lobed; stamens 3 to 40. Pistillate aments on terminal peduncle of the same season; calyx 4-lobed; ovary inferior, 1-celled. Nut divided internally by one true and several false partitions into several incomplete compartments; the seed so lobed as to fit the irregularities of the cavity. (From Jovis and glans, the nut of Jove.)

1. **J. Californica** Wats. CALIFORNIA WALNUT. Tree 30 to 50 ft. high; leaves 6 to 9 in. long; leaflets 11 to 15, oblong-lanceolate, serrate; staminate aments often in pairs, 3 to 5 in. long; stamens 30 to 40, anthers yellow, the connective bifid at the apex; fruit globose, $\frac{3}{4}$ to 1 in. in diameter.

Region of the Lower Sacramento and of the valleys about the northwestern base of Mt. Diablo, southward to the Sierra Santa Monica.

19. MYRICACEÆ. SWEET-GALE FAMILY.

Shrubs with fragrant alternate simple leaves, without stipules, and monœcious or diœcious flowers in oblong or cylindrical aments. Flowers solitary and sessile in the axils of scaly bracts; perianth none. Staminate flower with 4 to 16 stamens. Pistillate flower with a 1-celled, 1-ovuled ovary with 2 sessile filiform stigmas, surrounded at base by 2 to 4 small scales or bractlets. Cotyledons fleshy.

1. MYRICA L. BAY BERRY.

The only genus. (Name from the Greek murike, the ancient name of the Tamarisk.)

1. **M. Californica** Cham. WAX MYRTLE. Thickly-branched evergreen shrub, or small tree, 8 to 14 ft. high; leaves thick, glabrous, oblong, or oblanceolate-oblong, tapering above to an acute apex, narrowed below to a petiole, $2\frac{3}{4}$ to 5 in. long, remotely serrate, or almost entire; flowers monœcious; pistillate aments in the axils of the upper leaves, 3 to 5 lines long; staminate aments below, sometimes as much as 1 in. long; androgynous aments often occur between, with the staminate flowers at the base; staminate flower consisting of 7 or 10 to 16 stamens, united by their filaments into a cluster longer than the scale of the ament; bractlets 2, one on each side of the cluster at base, narrowly oblong, hairy at apex; ovary ovate with 2 bright-red exserted styles; fruit globose, brownish-purple, covered with a coat of whitish wax, 2 lines in diameter, the bractlets at the base minute.

Sand-dunes, moist hillsides, or rocky declivities near the ocean, from Santa Monica northward, along the entire California coast: San Francisco, where first collected by Chamisso; Oakland Hills; Tiburon; Bolinas Bay.

MYRICA HARTWEGI Wats., Sweet Bay, is a deciduous shrub of the Sierra Nevada, with diœcious flowers; stamens 3 or 4, shorter than the bract; bractlets exceeding the sub-compressed naked fruit.

20. URTICACEÆ. NETTLE FAMILY.

Ours herbs with stinging hairs and stipulate simple leaves. Flowers

small, greenish, unisexual, arranged in ament-like inflorescences. Petals none. Calyx in ours 2 to 4-toothed or -cleft, or of nearly distinct segments with as many stamens opposite the lobes, the filaments coiled or bent inward in the bud so that when released, they fly upwards like a spring, scattering the pollen. Ovary superior, 1-celled, 1-ovuled; style and stigma 1. Fruit an achene. Embryo straight.

Calyx 4-parted, the segments almost distinct, the inner ones largest in the fertile flower and enclosing the achene 1. URTICA.
Pistillate calyx sac-like, unequally 2 to 4-toothed, enclosing the achene;
staminate calyx 4-parted 2. HESPEROCNIDE.

1. URTICA L. NETTLE.

Annual or perennial herbs with stinging hairs, opposite petioled 3 to 7-nerved serrate leaves and distinct lateral stipules. Flowers in ours monœcious, clustered in axillary geminate racemes or heads. Staminate flowers of 4 sepals and 4 stamens. Pistillate calyx with the sepals unequal, the exterior smaller than the inner and at length enclosing the flattened achene; ovary with sessile tufted or almost feathery stigma, and erect orthotropous ovule. Endosperm scanty. (Ancient Latin name.)

Annual; inflorescence androgynous; stipules very small 1. *U. urens*.
Perennial; inflorescence unisexual; stipules large.

Herbage dark-green; upper leaves narrowly- to round-ovate, mostly cordate at base; stipules broadly oblong to elliptical; near the coast, rare

2. *U. Lyallii*
var. *Californica*.

Herbage gray; upper leaves ovate-lanceolate, obtuse to truncate at base; stipules narrowly oblong; common everywhere 3. *U. holosericea*.

1. *U. urens* L. SMALL NETTLE. Erect and simple or branching from the base, 1 to 1½ ft. high, leafy to the top; leaves elliptic or ovate, coarsely laciniate-serrate, 3 to 5-nerved, 1 to 2 in. long, slender petioled; stipules short, about 1 line long; inflorescence oblong, rather dense, mostly shorter than the petioles; flowers androgynous, that is, staminate and pistillate mixed in the same cluster.

Introduced weed. Berkeley.

2. *U. Lyallii* Wats. var. *Californica*. Often branched from the base, 2 to 3 ft. high; herbage dark green, the stems and foliage somewhat pubescent; leaves broadly ovate, cordate at base, coarsely serrate, 3 to 5 in. long, stipules broadly oblong to elliptical, obtuse, 3 to 6½ lines long; flowers in spreading panicles; sepals broadly ovate or rounded, obtuse, shorter than the broadly ovate achene, which is ⅔ line long.—(*U. Californica* Greene.)

Point Reyes Peninsula, *Greene* and *Jepson*; marshes near Tennessee Bay, Marin Co., *Eastwood*; Pilarcitos, *Davy*. Mar. The species is far northern.

3. *U. holosericea* Nutt. CREEK NETTLE. Herbage gray; stems strict, unbranched, 4 to 6 or even 10 ft. high; leaves ovate to lanceolate, 3 to 5½ in. long, on petioles ½ to 1 or 2 in. long, more or less pubescent on both faces or the upper surface green and with scattered bristles and the lower surface gray; stipules narrowly oblong, acute

or obtuse, 2 to 5 or 6 lines long; flowers in somewhat dense clusters, these disposed in mostly geminate (or somewhat paniculately branched) axillary racemes $3\frac{1}{2}$ in. long or less, the pistillate inflorescences somewhat shorter and in the axils above the staminate; stamens twice as long as the calyx, their filaments dilated at base; sepals of pistillate flower enclosing but scarcely exceeding the achene.

Very common along streams in the valleys throughout the state. Aug.—Sept.

2. HESPEROCNIDE Torr.

Annual herbs similar to the last genus, but the pistillate calyx consisting of a membranous flattened oblong-ovate sac with a minutely 2 to 4-toothed orifice. (Greek hespera, west or western, and knide, a nettle.)

1. *H. tenella* Torr. Slender, erect or straggling, 1 or 2 ft. high; stems and petioles bristly with scattered hairs, the blades very sparsely hispid; leaves thin, ovate, serrately incised, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long on slender petioles; flowers densely glomerate in the axils, the clusters shorter than the petioles; calyx thin, hispid with hooked hairs, in fruit $\frac{1}{2}$ to less than 1 line long; achene with minutely roughened pericarp.

Napa Co.; Bushy Knob (southeast of Mt. Diablo); and southward.

PARIETARIA DEBILIS Forster is unarmed and has alternate entire leaves without stipules and a tubular pistillate calyx.—Santa Barbara southward.

21. POLYGONACEÆ. BUCKWHEAT FAMILY.

Ours herbs or suffrutescent plants with alternate or opposite simple leaves and small regular apetalous mostly perfect flowers. Stamens 4 to 9, slightly perigynous. Calyx 3 to 6-cleft. Ovary 1-celled, bearing 2 or 3 styles or stigmas and a single erect orthotropous ovule. Fruit an achene, triangular in all ours except some species of *Polygonum* and *Eriogonum*.

Leaves without stipules.

Involucre bract-like, 1-flowered, enlarged in fruit, 2-lobed, 2-saccate on the back; leaves opposite, broad. 1. *PTEROSTEGIA*.

Involucre none; calyx involucre-like; leaves linear, in whorls 2. *LASTARRIEA*.

Involucre tubular, campanulate or turbinate; leaves alternate or in whorls or radical.

Involucre one-flowered; teeth of the involucre 3 to 6, cuspidate or awned, often hooked 3. *CHORIZANTHE*.

Involucre two to many-flowered and
Deeply 4 (3 to 5)-cleft, the lobes bearing bristles or awns, or awnless. 4. *OXYTHECA*.

Four to 8-toothed, the teeth blunt or at least not bristly . . . 5. *ERIOGONUM*.

Leaves with sheathing stipules, alternate; flowers without involucre.
Sepals 6, the outer 3 reflexed in fruit, the inner 3 erect and enlarging; calyx closing about the fruit and persisting as a hardened covering to the achene; flowers mostly green 6. *RUMEX*.

Sepals 5 (or 4), equal and erect in fruit; flowers mostly colored 7. *POLYGONUM*.

1. **PTEROSTEGIA** F. & M.

Very slender weak diffused annuals, dichotomous from the base, with opposite leaves. Involucres nearly sessile in the forks and terminal, consisting of a single bract, subtending and shorter than the solitary sessile flower, rounded and more or less 2-lobed or dentate on the margin, in fruit enlarged, scarious and reticulated, loosely enclosing the achene and with 2 sac-like gibbosities on the back. Calyx 6, rarely 5-parted; stamens 3 or 6. (Greek pteron, a wing, and stegia, a covering, in reference to the involucre.)

1. ***P. drymarioides*** F. & M. Stems commonly several from the base usually with a branch at each node, diffuse or straggling, from a few in. to 1 ft. long; leaves roundish or broader than long and notched once or twice at apex or even cleft, or distinctly fan-shaped or obcordate, 3 to 6 lines broad, narrowed at base to a slender but mostly short petiole; flower reddish, less than 1 line long; perianth segments lanceolate.

Open woods under Oaks or in the shade of rocky outcroppings: Berkeley; Mt. Diablo and southward to Southern California. Sierra Nevada. Last of Apr.-May.

2. **LASTARRIÆA** Remy.

Small fragile annual, diffusely branched from the base. Leaves linear, in cauline whorls and in a radical tuft which disappears early. Floral bracts in whorls, with hooked awns. Involucre none. Flowers sessile in the forks and terminal. Calyx simulating an involucre, tubular, 5 to 6-cl-ft to the middle, the teeth with recurved hooked awns. Stamens 3, inserted on the throat, with a small membranous tooth on each side of the filaments. (Jose Victorino Lastarria, 1817-1888, Chilean publicist and writer on the constitutional history of Chile.)

1. ***L. Chilensis*** Remy. Branches 2 to 4 or 8 in. long; floral bracts concealing the flowers; perianth 1 to 1½ lines long.

Introduced from Chile. Antioch; southward to Fresno and Monterey Cos. and Southern California. May-June.

3. **CHORIZANTHE** R. Br.

Low dichotomously branched annual herbs of summer, with rosulate radical leaves (which disappear early in the dry season). Cauline leaves opposite or ternate, frequently reduced and bracteate, the bracts sometimes unilateral. Involucres (in ours) 1-flowered; tubular or funnel-form, always sessile, 3 to 6-angled or -costate, and 3 to 6-toothed or -cleft; teeth divaricate, cuspidate or awned, the awns very frequently with a hooked tip. Flowers pedicellate or nearly sessile, ebracteolate, included within the involucre or the segments protruding. Calyx 6-parted or -cleft, often colored, never herbaceous. Stamens usually 9 (seldom 3 or 6), adnate to the base of the tube. Ovary glabrous. Embryo with inflexed or straight radicle. (Greek chorizo, to divide, and anthos, flower, on account of the parted perianth.)

Involucral teeth equal or the three alternate shorter.

Erect plants.

Calyx-segments equal, nearly distinct; involucre with broad scarious margin
1. *C. membranacea*.

Calyx-segments very unequal, the alternate shorter; involucre margin
none 2. *C. valida*.

Calyx shortly cleft, segments equal; involucre margin none or scanty . . .
3. *C. robusta*.

Erect or diffuse plants; involucre margins pink or white; calyx shortly cleft;
segments equal 4. *C. Douglasii*.

Prostrate plants; calyx segments equal.

Involucre usually margined; stamens 9 5. *C. pungens*.

Involucre not margined; stamens 3 6. *C. Clevelandi*.

Involucral teeth very unequal, 1 long and 5 very short; prostrate
7. *C. uniaristata*.

1. *C. membranacea* Benth. Erect, 6 to 12 or 14 in. high, unbranched, or once or twice dichotomous at the summit of the stem; herbage lanate throughout, floccose in age, the upper surface of the leaves glabrate; internodes about 2 in. long; leaves $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, linear, sessile, or gradually narrowed into a short petiole; involucre condensed into dense head-like cymes, these solitary in the upper axils and terminating the branches; margin of the involucre wholly scarious between the awned teeth; awns slender, uncinat, and strongly divergent; flowers 2 to 3, of these 1 or 2 undeveloped or nearly obsolete; calyx-segments distinct, broadly obspatulate with long narrow claw.

Inner Coast Ranges from the Vaca Mountains to Mt. Diablo.

2. *C. valida* Wats. Erect, 4 to 6 in. high, once or twice di- or tri-chorotomously branched; leaves spatulate; involucre teeth or lobes not margined but awned; awns mostly straight; inflorescence similar to the preceding; flowers pedicellate, partly exserted; calyx segments oblong, erose-denticulate, hirsute along the back on the midvein, very unequal (the alternate only $\frac{1}{2}$ as long).

Sonoma, *Samuels*; Petaluma; Russian River. Rarely collected.

3. *C. robusta* Parry. Stout, 6 to 24 in. high, ternately and dichotomously branched above, the stem below bearing two or three whorls of spatulate leaves, 2 in. long or less; heads large, dense, mostly terminal or sub-terminal; involucre with narrow margins or none, teeth mostly uncinat, the alternate shorter; calyx cleft $\frac{1}{3}$ the way down, slightly exserted or not at all; segments equal, oblong, apiculate.

Sandy soil at Alameda and near Santa Cruz. Apparently a good species but not well marked save by its erect habit and regular branching.

4. *C. Douglasii* Benth. Erect, with slender diffuse branches from the base or more commonly simple below the first or second nodes, 3 to 10 in. high, pubescent throughout; radical leaves oblanceolate; cauline similar but reduced above, 3 to 6 lines long; involucre in small loose clusters, each $1\frac{1}{2}$ lines long, densely hairy in the furrows, with pink scarious margins and straight or uncinat awns; calyx segments apiculate, the alternate often emarginate; hairy on the back.

Santa Cruz Mountains. The var. *DIFFUSA* Parry (*C. diffusa* Benth.) has the cauline leaves all reduced to narrow or very small bracts and the margins of the involucre usually white.

5. *C. pungens* Benth. Somewhat slender, villous-pubescent, the branches prostrate or at first erect, 2 to 12 or 15 in. long, subdichotomous; leaves spatulate or oblanceolate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, opposite petioles of the cauline leaves 3 lines long, those of the radical 9 lines or less; bracts linear or subulate acerose; involucre clustered on short lateral branchlets 2 to 3 lines long, unequally toothed, the alternate shorter; teeth of the involucre scarious margined, strongly uncinat; calyx narrowed at base, cleft about $\frac{1}{3}$ the way down; segments equal, oblong, erose-denticulate at summit, mucronulate; stamens 9, unequal, filaments plainly adnate to the lower part of the tube; styles slender, equaling the stamens.

Sand hills, San Francisco Peninsula southward to Monterey. *C. cuspidata* Wats. is plainly a synonym.

6. *C. Clevelandi* Parry. Plants prostrate, branched from the base, 4 to 16 in. broad, hairy pubescent; radical leaves ovate-spatulate, cauline leaves narrow and pungent; involucre with unequal divergent uncinat teeth; outer calyx segments shortly cleft, broadly ovate, erose; inner narrow and laciniat; stamens 3.

Coast Ranges north of San Francisco Bay, toward the interior: Napa and Lake Cos.

7. *C. uniaristata* T. & G. Stems prostrate, 2 to 6 in. long, with a short soft pubescence; leaves broadly spatulate, the bracts oblanceolate, cuspidate; involucre numerous but rather loosely cymose on the branches or sometimes densely clustered; involucre teeth not margined but awned; one awn long and straight, the others very short and hooked; flowers cream-colored; outer segments of the calyx entire, obovate, the inner $\frac{1}{2}$ as long, oblong; stamens 3.

Base of Mt. Diablo, June, 1884, M. K. Curran (the inner calyx segments not entire); more common southward: Salinas, *Palmer*.

4. *OXYTHECA* Nutt.

Slender annuals with the internodes more or less covered with stipitate glands and a repeatedly dichotomous inflorescence. Leaves in a rosette at base. Bracts foliaceous and more or less connate, often in 3's. Involucres few-flowered, more or less distinctly pedicellate, campanulate or turbinate, 3 to 5-cleft, the teeth bearing a bristle or awn, or awnless. Flowers mostly exserted. Calyx segments equal, glandular-pubescent on the outside. Stamens 9. Achene commonly lenticular. (Greek *oxus*, sharp, and *theke*, case, in allusion to the spiny involucre.)

1. *O. hirtiflora* (Gray) Greene. About 6 in. high, glandular-puberulent; leaves oblong-spatulate, with scabrous ciliate margins and a broad red mid-vein; bracts hispid; involucre awnless, turbinate, $\frac{1}{2}$ line long, deeply and unequally 4-lobed, on erect or nodding pedicels 1 to 3 lines long; flowers 3 to 5, yellowish, tinged with red, $\frac{1}{2}$ line long; achenes triangular, exserted.—(*Eriogonum hirtiflorum* Gray.)

Mt. Diablo and Mt. Hamilton, acc. to Greene; Sierra Nevada.

O. INERMIS Wats. has been doubtfully credited to Mt. Diablo.— Bracts 2 or 3 lines long; involucre shortly pediceled, 4-cleft nearly to the base, awnless; flowers rose-color, $\frac{1}{2}$ line long; inner segments smaller and retuse.

5. *ERIOGONUM* Michx.

Annuals or perennials with radical or alternate or whorled leaves without stipules, the upper bract-like. Flowers perfect, involucre. Involucre 4 to 8-toothed or -lobed, several to many-flowered; pedicels more or less exserted, intermixed with narrow scarious bracts. Calyx 6-parted or -cleft, colored, persistent about the achene. Stamens 9, inserted on the base of the calyx. Styles 3; stigmas capitate. Achene triangular, except in a few species. Embryo straight, in the axis of scanty endosperm; cotyledons foliaceous. (Greek erion, wool, and gonu, knee or joint, the nodes hairy in some species.)

Involucres turbinate, deeply lobed, the lobes becoming reflexed, disposed in a simple or compound umbel, raised on a scape-like peduncle from a leafy perennial and more or less woody base; calyx narrowed to a stipe-like base; filaments hairy below.

Woody base much branched; leaves obovate to oblanceolate; acute, $\frac{1}{2}$ to 1 in. long. 1. *E. stellatum*.

Woody base very short and simple; leaves oblong-ovate, cordate at base, $1\frac{1}{2}$ to 2 in. long. 2. *E. compositum*.

Involucres cylindric-turbinate or prismatic, 5 to 6-nerved, with erect teeth, always sessile, either disposed in heads in a cymose panicle or umbel-like inflorescence or solitary and scattered along the virgate branches; calyx not attenuate at base; filaments usually glabrous.

Peduncles scape-like; involucre capitate-clustered; perennials.

Heads 1 to 3 or 4, large and terminal, or the peduncle forked and umbel-like; bractlets densely villous-tomentose. 3. *E. latifolium*.

Heads scattered in an ample cymose panicle; bractlets glabrous. 4. *E. nudum*.

Stems parted from the base or above the base into mostly elongated flowering branches, along which the solitary involucre are scattered, rarely 2 to several in a cluster.

Perennials, with short woody stems which are densely leafy.

Leaves obovate or oblanceolate, acute; bracts all small and triangular. 5. *E. Wrightii*

var. *trachygonum*.
6. *E. saxatile*.

Leaves roundish; lower bracts subfoliaceous. 6. *E. saxatile*.

Annuals; leaves mostly in a rosette at base.

Inflorescence somewhat umbel-like, the 2 to 4 rays once or twice di- or tri-chotomous, or 1 or 2 simple. 7. *E. truncatum*.

Plants for the most part di- or tri-chotomously parted from the base or the middle, with the flowering branches much elongated and the involucre scattered along them.

Involucres narrow or turbinate, 1 to $1\frac{1}{2}$ lines long; flowers glabrous; often diffusely branched.

Stems and inflorescence glabrous; teeth of the involucre inconspicuous. 9. *E. vimineum*.

White-woolly throughout; teeth of the involucre prominent. 8. *E. gracile*.

Involucres cylindric, 2 lines long.

Flowers glabrous; erect and strictly branched. 10. *E. virgatum*.

Flowers villous on the outside; more or less umbellately branched, sometimes very diffuse. 11. *E. dasyanthemum*.

Involucres turbinate, on filiform pedicels; panicle repeatedly dichotomous, commonly leafy at the nodes. 12. *E. angulosum*.

1. *E. stellatum* Benth. Somewhat tomentose, the leaves densely

tomentose on both sides or glabrate above; peduncles naked from a diffusely branched woody base, the branches leafy, especially at the ends; leaves obovate to oblanceolate, acute, $\frac{1}{2}$ to 1 in. long; peduncle naked, 6 to 10 in. high, bearing an umbel of 2 to 4 usually elongated and cymosely-divided rays; nodes and lateral rays all leafy-bracted; lobes of the involucre nearly as long as the turbinate tube; flowers yellow or yellowish, slightly tinged with red on the outside, 2 or 3 lines long.

Sierra Nevada. Of infrequent occurrence in the Coast Ranges; summits of Mt. Diablo, Mt. Hamilton, and Mt. San Carlos, southward to Southern California.

2. **E. compositum** Dougl. Peduncles stout, 6 to 16 in. high from a simple short caudex; leaves oblong-ovate, cordate at base, $1\frac{1}{2}$ to 2 in. long, white-tomentose on the under side, the upper surface green and merely woolly-flocculent; petioles long ($1\frac{1}{4}$ to 4 in.); umbel either simple or compound, the rays 6 to 9, $\frac{1}{2}$ to 2 in. long, each bearing a short several-rayed umbellet, subtended by whorls of linear-oblanceolate leaves; lobes of involucre short; flowers 2 to 4 lines long, cream-colored or yellow.

Mountains of Napa and Sonoma Cos. acc. to Greene; volcanic rocks near Long Valley, Mendocino Co., *Bolander*, and northward. Rays often with a blackish band at middle.

3. **E. latifolium** Smith. Stout, tomentose throughout, the indurated caudex with short leafy branches; leaves 1 to 2 in. long, oblong to ovate, obtuse or acute at apex, rounded or cordate at base, rarely cuneate, the margin often undulate and upper surface glabrate with under surface very densely woolly; petiole often margined; peduncles erect or ascending, 5 to 12 in. high, very stout, not fistulous; bracts triangular; involucre very many-flowered, crowded into large heads which are either solitary and terminal or few in a simple or nearly simple umbel; involucre tomentose, 2 lines long; flowers glabrous, light rose-color, $1\frac{1}{2}$ lines long; bractlets densely villous-tomentose.

Rocky or sandy places along the sea-coast from Humboldt Co. to Southern California. June-July.

4. **E. nudum** Dougl. Tall and slender, sparingly leafy at base, mostly glabrous above; leaves broadly ovate or oblong, obtuse, $\frac{1}{2}$ to 2 in. long, cordate or abruptly cuneate at base, on slender petioles, undulate, densely tomentose beneath, becoming glabrate above; peduncle (fistulous and sometimes inflated) and the sparingly-branched panicle a foot or two high, smooth; involucre 2 or 3 lines long, glabrous or nearly so, usually 3 to 6 in each cluster; flowers glabrous or sometimes more or less villous, 1 to $1\frac{1}{2}$ lines long, white or reddish, sometimes sulphur-yellow.

Common in both the Coast Ranges and Sierras, in the dry foothills and at middle elevations.

Var. **oblongifolium** Wats. Leaves broadly oblong, 1 to $2\frac{1}{2}$ in. long, abruptly contracted to slender petioles 3 in. long; perianth

usually somewhat pubescent on the inner lobes.—Napa Co., and northward.

5. *E. Wrightii* Torr. var. *trachygonum*. Woody base much branched, the branches erect, very leafy and 6 to 11 in. high; leaves obovate or oblanceolate, acute, white-tomentose on both faces, short-petioled, 3 to 6 lines long, often with smaller ones fascicled in the axils, or the lowermost twice as long with longer petioles; inflorescence short-peduncled, once or twice dichotomous, the branches erect; lower involucre scattered, the upper approximate, campanulate-tubular, prominently but obtusely angled and woolly between the angles; flowers $2\frac{1}{2}$ lines broad; sepals white with a green midrib, the inner longer than the outer.—(*E. trachygonum* Torr.)

Dry gravel beds of interior streams from Putah Creek, *Jepson*, southward to the Mt. Diablo range, *Brewer*, and about Mt. Hamilton, *Greene*. Sept.—Oct.

6. *E. saxatile* Wats. Tomentose throughout, becoming flocculent, 8 to 16 in. high, the base of the peduncles or caudex densely leafy; leaves roundish, both sides with a dense, often felt-like tomentum, 3 to 8 lines broad, short-petioled; peduncle 3 to 5 in. high, the branches of the inflorescence short and spreading; bracts (especially the lower) subfoliaceous, triangular or oblong, acute; involucre $1\frac{1}{2}$ to 2 lines long, its teeth acute; flowers yellowish or rose-tinted, 2 lines long; sepals all spatulate-oblong and carinate, about equal.

Southern California northward to Mt. Hamilton, acc. to *Greene*. July.

7. *E. truncatum* T. & G. Slender thinly tomentose annual 1 ft. high, with many stems from the base; leaves obovate or oblong-oblanceolate, with undulate margin, 1 in. long, attenuate to a slender petiole usually quite as long; peduncle short, bearing a leafy-bracted umbel-like inflorescence of 4 to 6 elongated rays, which are loosely once or twice di- or tri-chotomous; bracts nearly minute; involucre solitary or 2 to 4 in a cluster, tomentose, oblong-turbinate, 2 lines long; flowers light rose-color, 1 line long.

Dry foothills east of Mt. Diablo, where first collected by *Brewer*, May 29, 1862.

8. *E. gracile* Benth. Floccose-tomentose throughout, somewhat strict and narrowly paniced, or more diffuse, 5 to 11 in. high; leaves oblanceolate or broadly oblong, attenuate to a slender petiole, 1 to $1\frac{1}{2}$ in. long or less, tomentose on both sides or less so above; bracts more or less elongated or somewhat foliaceous; involucre 1 line long or less, broader above, with rigid acute, and rather prominent teeth, often dark brown; flowers white, rose-color or yellowish, $\frac{3}{4}$ line long.

Dry plains or valleys; Solano Co., and southward.

9. *E. vimineum* Dougl. Glabrous or at least not tomentose, unless at the very base, erect, 9 to 18 in. high, much branched from near the base, the branches elongated and virgate, with the lower commonly in whorls of 4 or 5; lower forks often leafy; leaves orbic-

ular to broadly ovate, 3 to 10 lines broad, greenish, reddish, or yellowish, white tomentose below; margin undulate, at least in age; the petioles as long or longer; involucre very narrow, 1 line long; flowers rather few, rose-color, or yellowish, 1 line long; outer sepals obovate, inner oblong.

Common in the Coast Ranges, especially towards the interior. Sept.

Var. *caninum* Greene (E. Nortoni Greene as to plant of Bay Region). Stems numerous from the base, repeatedly di- or at first tri-chotomous, procumbent or very diffuse, sometimes erect and branching only above the base; inflorescence and stems reddish; involucre mostly at the ends of the short branches or sessile in the forks.—Oakland Hills; Tiburon. July–Oct.

10. *E. virgatum* Benth. Tomentose throughout, stem slender, erect, simple, or the few branches strict, 1 to 2 ft. high; leaves rosulate at the base, oblanceolate, an inch or two long, on slender petioles, the margin usually undulate; involucre rather remote, tomentose, cylindric, 2 lines long; bracts lanceolate, shorter than the involucre; flowers 1 line long, buff or sulphur-yellow.

Stream beds of Coast Range rivers and creeks: Putah Creek; Kelseyville, Lake Co.; Russian River near Cloverdale; Walnut Creek; also in the Sierras. Aug.–Sept.

11. *E. dasyanthemum* T. & G. Plants clothed with a thin coat of tomentum which is soon deciduous, 1 to 2 ft. high, more or less umbellately branching from or near the base, and often very bushy in habit; leaves roundish, plane, tomentose below, less so above, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, abruptly contracted to a slender petiole as long or half as long; involucre rather remote, cylindric, 2 lines long, tomentose between the callous ribs; flowers few, scarcely exerted, white or rose-color, densely villous on the outside.

North Coast Range country towards the interior; Vaca Mountains to Clear Lake, where first collected by Bolander and later by Torrey. Sept.

Var. *Jepsonii* Greene. Lower branches in whorls of 3 to 5; lower leaves 2 in. long; panicle ample; flowers deep red.—Gates' Cañon, Vaca Mountains.

12. *E. angulosum* Benth. Gray tomentose or nearly green, 3 to 14 in. high, diffusely branching from near the base, and repeatedly dichotomous, the plants frequently broader than high; branches 4 to 6-angled; radical leaves roundish to broadly oblong or lanceolate, commonly undulate, $\frac{1}{2}$ to 1 in. long, on rather short petioles; upper leaves oblong to lanceolate or oblanceolate, sessile or nearly so; involucre on filiform pedicels 3 to 8 lines long, mostly in the forks or terminal, hemispherical, 1 to 2 lines broad, many-flowered, glabrous or minutely glandular, bractlets mostly firm and dilated; calyx segments pink with a red-purple midvein running nearly to the apex, $\frac{1}{2}$ line long, nearly glabrous; outer segments ovate, concave, the inner oblong-lanceolate.

Common in Southern California and in the Upper San Joaquin

Valley northwestward to Monterey; Corral Hollow, *Brewer*; Tracy, *Benj. Cobb*; Stockton, *Parry*. Apr.

6. RUMEX L.

Weed-like perennial herbs. Leaves alternate, the petioles with entire somewhat sheathing stipules. Flowers greenish, reddish or yellowish, crowded and commonly whorled in paniced racemes. Calyx of 6 sepals, nearly distinct, the 3 inner larger, petal-like, accrescent in fruit and connivent over the achene, 1 or more of them usually bearing a callous grain or tubercle on the back; the 3 outer spreading or reflexed. Stamens 6. Styles 3, short; stigmas tufted. Achene triangular. Embryo lateral. (Old Latin name used by Pliny.)

EMEX AUSTRALIS Steinh., native of South Africa and Australia, is adventive on our sea-beaches, acc. to Greene; flowers unisexual; pistillate calyx in fruit thick and almost woody and the outer lobes thorn-like.

Flowers diœcious; inner sepals without callous grains, not reticulated and not longer than the achene; leaves hastate.—SORRELS. . . 1. *R. Acetosella*.

Flowers perfect or andro-monoœcious; inner sepals commonly reticulated; in fruit becoming much longer than the achene; leaves never hastate.—DOCKS.

Inner fruiting sepals entire (or only low-denticulate) and

Not grain-bearing, 3 to 6 lines long 2. *R. occidentalis*.

All grain-bearing, or 1 or 2 naked, 1 to 2½ lines long; pedicels jointed near the base, recurved or geniculate.

Leaves strongly undulate, elliptical to oblong-lanceolate.

3. *R. crispus*.

Leaves slightly undulate, mostly oblong or ovate . . . 4. *R. conglomeratus*.

Leaves plane, lanceolate 5. *R. salicifolius*.

Inner fruiting sepals with very prominent slender teeth or bristles, grain-bearing.

Perennial; flowers in dense whorls, the whorls remote.

Flowering branches divaricate; pedicels jointed in the middle

6. *R. pulcher*.

Flowering branches sub-erect; pedicels jointed near the base

7. *R. obtusifolius*.

Annual; whorls mostly spicate-crowded; pedicels jointed near the base.

8. *R. persicarioides*.

1. *R. Acetosella* L. SORREL. Stems tufted, commonly 9 in. high; radical and lower leaves hastate, the upper reduced or the branches leafless and ending in the reddish (pistillate) or yellowish (staminate) panicle; pedicels capillary, as long or twice as long as the flowers; staminate flowers 1 line long or less, the pistillate ½ as long.

Introduced. Very common in the seaward Coast Range region, propagating freely by creeping roots and often hard to exterminate. May.

2. *R. occidentalis* Wats. WESTERN DOCK. Erect, glabrous, stout, and nearly simple, commonly 3 or 4 ft. high; leaves somewhat fleshy, oblong-ovate or ovate, truncate or subcordate at base, mostly narrowed toward the apex, the blade 16 in. long or less, the petioles of the radical leaves longer than the blade; panicle strict, mostly very dense, 1 ft. long or more, leafless or with a few small leaves below, rosy in fruit; pedicels 3 to 6 lines long, obscurely jointed below the middle; inner fruiting sepals broadly ovate, subcordate.

Marshes bordering the bays.

3. **R. crispus** L. CURLY DOCK. Stoutish, commonly 2 ft. high; leaves bluish-green, very wavy-margined or crisped, elliptical to oblong-lanceolate, the base often somewhat decurrent upon the petiole, 10 in. long or less; flowering branches strict, with few leaves, the whorls dense and mostly crowded; pedicels twice as long as the fruit, tumidly jointed near the base; inner fruiting sepals broadly ovate, scarcely cordate, 2 to 2½ lines long, all with smooth callous grains.

Very common naturalized weed in neglected lands. May-June.

4. **R. conglomeratus** Murr. GREEN DOCK. Stems slender, mostly clustered, 3 to 4 ft. high; leaves ovate or mostly oblong, slightly undulate, 4 in. long, reduced above; flowering branches slender, the whorls remote, with a lanceolate or ovate leaf subtending every whorl or almost naked; pedicels slender about as long as the fruit, tumidly jointed near the base and geniculate; inner fruiting sepals oblong, $\frac{3}{4}$ to 1½ lines long, callous grains mostly 3 and smooth.

Naturalized. Very abundant in low lands about San Francisco Bay, sometimes exclusively occupying several acres. June-Aug. The grain is very large, nearly covering the fruiting sepal, leaving only a narrow wing; in *R. crispus* the grain is relatively small and the fruiting sepal large. In both of these species the blade is more or less decurrent upon the petiole; in *R. occidentalis* not decurrent. *R. conglomeratus* is a much more slender and a taller plant than *R. crispus*.

5. **R. salicifolius** Weinm. WILLOW-LEAVED DOCK. Commonly tufted, 2 ft. high; leaves plane, glaucous, lanceolate, acute at both ends, petiolate, 1½ to 4 in. long, including the short petiole; flowering branchlets short, about 2 in. long and the lateral mostly divaricate; whorls dense, crowded, leafless, or 1 or 2 lower whorls remote and leafy; pedicels rather shorter than the fruit, jointed near the base and recurved but not geniculate; inner fruiting sepals triangular-ovate, 1 to 2 lines long, the callous grains variable in number, smooth or pitted.

Not so common as *R. crispus* but found throughout California in valley lands. May easily be recognized by its glaucous willow-like foliage.

6. **R. pulcher** L. FIDDLE DOCK. Stem slender but rigid, widely branched above, the branches zigzag; leaves oblong or fiddle-shaped, 3 to 5½ in. long, petiolate; flowering branches simple, divaricate, sparsely leafy, the dense whorls remote; pedicels stout, about equaling the fruit, tumidly jointed in the middle; inner fruiting sepals with 5 to 10 awn-like teeth on each side, one sepal often larger than others; callous grain often solitary.

Common naturalized wayside weed, readily recognized by its zigzag branches. June.

7. **R. obtusifolius** L. BITTER DOCK. Tall, slender, 3 ft. high or more; leaves ovate-oblong to oblong-lanceolate, somewhat undulate, acute or obtuse, truncate or cordate at base, 6 in. long or less, long-

petioled; flowering branches in a rather strict panicle, leafless or with a few little-reduced leaves at the base; whorls loose, not crowded, the lower remote, pedicels slender, 1 to 2 times as long as the fruit, tumidly jointed toward the base; inner fruiting sepals ovate-deltoid, $1\frac{1}{2}$ to 3 lines long, with 3 to 5 thin triangular or subulate teeth on each side; grain 1 only or with 2 other small ones.

Introduced species in low lands, rarely collected, perhaps mistaken for *R. conglomeratus*. Lagunitas, Marin Co.; Presidio, San Francisco; and Alameda Co. July.—Sept. Inflorescence sometimes deep-red.

8. *R. persicarioides* L. GOLDEN DOCK. Stems prostrate or erect, seldom more than 1 ft. high, soft, mostly fistulous; herbage yellowish-green, minutely pubescent; leaves oblong or lanceolate, truncate or subcordate at base, acute at apex, a little undulate, the blade 2 to 4 in. long, rather short-petioled; inflorescence spicate-compacted with scattered sub-equal leaves, or the lower whorls remote; pedicels capillary, very unequal, tumidly jointed at base; inner fruiting sepals $\frac{3}{4}$ to $1\frac{1}{2}$ lines long, acutely produced at apex, with 2 or 3 awn-like teeth on each side; callous grains 3.

Shores of lakes or in marshy lands. Mountain Lake, San Francisco; Alvarado. July—Aug.

7. POLYGONUM L.

Herbaceous or suffrutescent plants. Leaves entire, alternate, with scarious sheathing stipules ("sheaths"), these entire, ciliate or lacerate. Flowers white, red, or greenish, on jointed pedicels. Calyx red, white, or sometimes greenish, in all ours 5-cleft or -parted, the divisions erect in fruit. Stamens 4 to 9. Styles 2 or 3. Achene lenticular or triangular, enclosed in the fruiting calyx. Embryo curved, lying in a groove at an angle of the endosperm. (Greek *polus*, many, and *gonu*, knee, on account of the nodose zigzag stem of many species.)

Flowers in axillary clusters, either widely separated or crowded into a terminal raceme, with foliaceous bracts; stamens mostly 8, the filaments or some of them often dilated at base; achene triangular; leaves mostly narrow and lanceolate or linear, jointed upon a very short petiole adnate to the short sheath of the scarious stipules.—Subgenus *AVICULARIA*.

Perennial and more or less suffrutescent.

Flowers several in a cluster, crowded at the ends of the branches; stipules conspicuously lacerate; leaves revolute; stems ascending or prostrate, from large woody rootstocks. 1. *P. Paronychia*.

Flowers 1 or 2 in each axil, less crowded; stipules 2-lobed, the lower lobe lacerate; leaves plane; flowering stems strictly erect from horizontal or prostrate woody branches or from the woody crown of a very strong taproot. 2. *P. Bolanderi*.

Annuals.

Prostrate; branches leafy to the ends. 3. *P. aviculare*.

Erect; leaves diminishing upwards and becoming bract-like, the branches terminating in more or less loose spikes. 4. *P. spargulariaeforme*.

Flowers spicate, solitary in the axils, the internodes very short; stamens 8; achene triangular; leaves very narrow, not jointed to the lacerate stipule; ours slender wiry brittle annuals.—Subgenus *DURAVIA*.

Plants 3 to 7 in. high; flowers in terminal or axillary spikes. 5. *P. Californicum*.

Plants 1 to 2 in. high, flowering even from the base; leaves 1 to 2 lines long

6. *P. Purryi*.

Flowers in dense spicate racemes (usually geminate or paniculate), with small scarious bracts; calyx 5-parted, appressed to the triangular or lenticular achene; stamens 4 to 8, filaments filiform; leaves ample, not jointed to the petiole.—Subgenus *PERSICARIA*.

Racemes solitary or sometimes 2; flowers red; stamens 5, exserted; achene lenticular; mostly aquatic perennials.

Sheathing stipules neither fringed at summit nor with a spreading margin.

Leaves mostly elliptical or oblong; spikes oblong or ovate, $\frac{1}{2}$ to 1 in. long

7. *P. amphibium*.

Leaves ovate-lanceolate; spikes more elongated, 1 to 3 in. long.

8. *P. Muhlenbergii*.

Sheathing stipules ciliate-fringed at summit and with a spreading foliaceous border.

9. *P. Hartwrightii*.

Racemes several to many, geminate or more or less paniculate; stamens 6 to 8, included; achene either lenticular or triangular.

Sheathing stipules naked in age; racemes often drooping; sepals white or flesh-color; stamens 6; annual.

10. *P. lapathifolium*.

Sheathing stipules fringed with bristles; racemes erect.

Sepals pink, red or greenish; racemes not interrupted; stamens generally 6; annual.

11. *P. Persicaria*.

Sepals greenish and glandular-dotted; racemes interrupted; stamens 8; perennial of marshy places.

12. *P. punctatum*.

Flowers in loose paniced racemes; stamens 8; achene triangular; leaves cordate; twining plants.—Subgenus *TINTARIA*.

Annual. 13. *P. Convolvulus*.

1. *P. Paronychia* C. & S. Stems suffrutescent, prostrate or ascending, 1 to 3 ft. long; branches leafy above, below clothed with old sheaths; sheaths large, 4 to 6 lines long, brown and 5-nerved, the margin freely lacerate above, persistent, the segments becoming hair-like in age; leaves linear-lanceolate, 5 to 8 or 11 lines long, acute, the margin revolute; flowers about 3 in an axil, on short pedicels, densely crowded at the ends of the branches in short more or less leafy spikes; sepals rose-color, veined with green or brown, 3 lines long, oblong-obovate; stamens 8; styles as long as the ovary; achene smooth and shining, 2 lines long or more.

Sandy hills near the coast: San Francisco and northward.

2. *P. Bolanderi* Brewer. Taproot woody and strong, either with a conspicuous crown or with horizontally spreading or prostrate suffrutescent branches 4 or 5 in. long; stems of the season numerous and erect, either arising from the woody crown or from the suffrutescent branches, 5 to 10 in. high, slender, simple, with short strict leafy branchlets towards the top; sheathing stipules scarious, 2-lobed; the lower lobe finely lacerate, persistent; leaves narrowly linear to subulate, acute or cuspidate, 2 or 3 lines long, not revolute; flowers 1 or 2 in the axils on the branchlets, involucrate with a sheaf-like scarious bract on the joint of the very short pedicel, $1\frac{1}{2}$ lines long; calyx 5-parted; sepals white or rose-color, with a green midrib, oblong-ovate, slightly spreading; stamens 8 or 9, included; styles 3-parted; achene triangular.

On rocky outcroppings, mostly in the lowest foothills; known only from the Mayacamas Range and parallel chains: Suscol Hills; Hood's Peak; east of Napa City, and northward to the La Jota Plateau on Howell Mountain. July–Sept.

3. *P. aviculare* L. WIRE GRASS. YARD GRASS. Glabrous and green; stems wiry, minutely striate, prostrate, often several ft. long, flowering from the base; leaves oblong, acute, 3 to 6 lines long; flowers on very short pedicels, 2 lines broad when expanded; calyx cleft into oblong lobes which are white with a green center; stamens 8, the 3 inner with dilated bases; styles 3, very short; achene ovoid, dark brown, minutely granular.

Naturalized: common in hard, especially beaten soils, and sometimes in cultivated lands; flowering through the summer into early winter.

4. *P. spargulariæforme* Meisn. Annual, much branched and somewhat diffuse, or sparingly branched and more strictly erect, 4 to 13 in. high; sheaths with a short mostly scarious base and lacerate summit; leaves linear or oblanceolate, at least narrow, 1-nerved, acute, 6 to 13 lines long; spikes 4 in. long or less, very slender, the flowers much scattered below, crowded above; calyx rose-color or white; stamens 8, included, the filaments hardly dilated at base; style as long as the ovary, 3-parted.—(*P. coarctatum* Dougl.)

Dry hills. Petrified Forest, Sonoma Co., acc. to Greene; lower slopes of Mt. St. Helena on the Middleton grade, *Davy*; and northward to the Mt. Shasta Region. Oct.

5. *P. Californicum* Meisn. Annual, 3 to 7 in. high; diffusely branched just above the base, the stems slender and wiry, the ultimate branches elongated and floriferous; herbage glabrous, but the brownish stems striate and minutely scabrous; leaves linear to filiform, cuspidate, 3 to 6 lines long, not jointed to the sheathing stipules which are deeply lacerate-fringed and imbricated on the upper portion of the very slender and elongated spikes; bracts subulate, 1 or 2 lines long; flowers solitary and sessile in each axil; sepals white with rose-colored midvein; achene narrowly lanceolate, slightly exserted; styles slightly divergent.

Dry hills from Napa Valley and Lake Co. to northern California.

6. *P. Parryi* Greene. Dwarf compact annual, commonly branching from base, 1 to 2 in. high; stems rigid and brittle, bearing flowers even to the base; leaves narrowly linear, acute, cuspidate, 1 to 2 lines long; stipules so extremely lacerate as to appear cottony, and often hiding the flowers; flowers solitary and sessile in the axils, the bract broad, laciniate to the middle; stamens included; style 3-parted; achene triangular.

Sierra Nevada; Coast Ranges, Howell Mountain, acc. to Brandegee, and (?) headwaters of the Eel in Lake Co., *Jepson*.

7. *P. amphibium* L. WATER PERSICARIA. Aquatic glabrous perennial with stout stems not branching above the rooting base; leaves floating, elliptical to oblong or oblong-lanceolate, truncate or rounded at base, 2 to 5 in. long on petioles nearly 1 to 2½ in. long; sheaths leaf-bearing at about the middle; spike terminal, dense, ovate or oblong, ½ to 1 in. long, on a commonly short peduncle; calyx bright rose-color, 1½ to 3 lines long, the 5 stamens and 2-cleft style exserted; achene lenticular, smooth.

Ponds and lakes in the mountains of the Coast Ranges and Sierra Nevada and also in sloughs of the interior valleys.

8. **P. Muhlenbergii** Wats. Perennial, aquatic or in half dry places; leaves and upper portion of the simple stem appressed-hirsutulose or scabrous, the peduncle glandular with short hairs; leaves thin, ovate-lanceolate to lanceolate, acuminate or even attenuate, usually rounded at base, 3 to 8 in. long, the petioles 1 to $3\frac{1}{2}$ in. long; spikes 1 to 3 in. long, often in pairs; calyx rose-color or pink, 5-parted to the middle; stamens 5, exserted; style 2-cleft; achene lenticular.

Mountain Lake, San Francisco; Healdsburg, *Alice King*; ranging to the interior (sloughs of the Lower Sacramento, *Jepson*). June-Oct.

9. **P. Hartwrightii** Gray. Perennial; closely allied to *P. amphibium* but differing in its rough hairy sheaths, which are ciliate and usually with an abruptly spreading herbaceous margin; leaves mostly narrow, either lanceolate or oblong, 2 to 7 in. long, on very short petioles, arising from the middle of the sheath.

Sierras; in the Bay Region, acc. to Greene.

10. **P. lapathifolium** L. COMMON KNOTWEED. Annual, commonly stout, 1 to 4 ft. high, branching, glabrous except a very scanty glandular pubescence on the peduncles and a scabrous pubescence on the leaf-margins; leaves broadly lanceolate, attenuate upward from near the base and mostly long-acuminate, cuneate at base and short-petioled, 4 to 5 in. long; spikes axillary and terminal, oblong and erect or linear and nodding, 1 in. long or more; calyx white or flesh-color, 1 line long; stamens 6, included; styles 2 or 3-parted; achene lenticular or rarely triangular.—(*P. nodosum* Pers.)

Common along streams or in low or marsh land, often whitening great areas. Aug.—Sept.

11. **P. Persicaria** L. LADY'S THUMB. Resembling *P. lapathifolium* but the sheaths and bracts conspicuously ciliate; leaves sessile; spikes shorter and erect; stamens generally 6, included; style 2 or 3-parted.

Rarely seen.

12. **P. punctatum** Ell. DOTTED SMART-WEED. Perennial, rooting and decumbent at base, erect and branching above, 2 to 5 ft. high, glabrous or the margin of the leaves scabrous; leaves lanceolate to linear-lanceolate, acuminate, attenuate to a very short petiole, about 3 in. long; sheaths and the short bracts bristly-ciliate; inflorescence a panicle of spike-like racemes, these loose and filiform, 1 to 3 in. long, erect on long peduncles; calyx greenish, conspicuously glandular, 5-parted, 1 line long; stamens 8, included; styles 2 or 3-parted to the base; achene lenticular or triangular.—(*P. acre* HBK.)

Common in low and especially marshy ground or in moist mountain meadows; Howell Mountain. Sept.

13. **P. Convolvulus** L. BLACK BINDWEED. Twining or trailing, the stems 1 to several ft. long; herbage glabrous, pale green;

leaves 1 to 2 in. long, ovate, sagittate at base, acuminate at apex; flowers either in axillary clusters or disposed in a raceme; calyx 5-cleft, in fruit minutely scurfy and closely investing the black achene which is 2 lines long.

Introduced: region of Mt. Shasta; about Berkeley acc. to Greene.

22. SAURURACEÆ. LIZARD-TAIL FAMILY.

Ours perennial astringent herbs, with nodose scape-like stems and alternate entire petioled leaves. Flowers perfect, bracteate, in a dense terminal spike. Perianth none. Stamens generally 3 to 6. Ovary 1-celled, with 1 to 5 stigmas. Fruit a capsule or berry.

1. ANEMOPSIS Hook.

Stoloniferous herb with aromatic rootstock and astringent somewhat spicy herbage. Leaves mostly radical. Spike conical, surrounded at base by a persistent showy involucre of 5 to 8 bracts; each flower (except the lowest) also subtended by a small white bract. Stamens 6 to 8. Ovary sunk in the rachis of the spike, 1-celled, with 3 to 4 stigmas. Capsule dehiscent at the apex. (Greek anemone, and opsis, appearance, since the flowers resemble those of *Anemone*.)

1. **A. Californica** Hook. YERBA MANSA. Stems hollow, $\frac{1}{2}$ to 2 ft. high, with a broadly-ovate or elliptic clasping leaf above the middle and a fascicle of 1 to 3 small petioled leaves in the axil; radical leaves elliptic-oblong, rounded above, often somewhat narrowed toward the cordate base, 2 to 8 in. long, on petioles 5 to 8 in. long or less; spikes $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; involucre bracts white (or reddish beneath), oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; floral bracts obovate, unguiculate, $2\frac{1}{2}$ to 3 lines long; ovules 6 to 10 on each placenta.

Saline and rather wet places: Collinsville (Sacramento Valley) and southward; Walnut Creek; Alameda Marshes; San Jose. May-July. Flowers protandrous.

23. FRANKENIACEÆ. FRANKENIA FAMILY.

Ours low perennial herbs or somewhat suffrutescent plants, with opposite entire leaves and no stipules, perfect flowers, a 1-celled superior ovary with 2 to 4 parietal placenta, and seeds with a straight embryo.

1. FRANKENIA L.

Leaves small, crowded and fascicled in the axils. Flowers sessile, solitary, or by the reduction of the upper leaves to bracts becoming somewhat cymose. Calyx tubular, furrowed or almost prismatic, 4 or 5-toothed. Petals 4 or 5, appendaged at the very base of the blade, the appendage decurrent on the claw. Stamens in ours about 6 (4 to 7), hypogynous, exerted from the tube. Style in ours 3-cleft, included. Capsule included in the persistent calyx, 2 to 4-valved, the seeds attached by filiform funiculi to the margins of the valves. (Named for I. Frankenius, Swedish Professor of Medicine.)

1. *F. grandifolia* C. & S. YERBA REUMA. Erect or diffuse, slightly woody at base, 8 to 13 in. high, smooth or somewhat pubescent or short-hirsute, particularly at the nodes; leaves obovate to linear-oblong, 3 to 6 lines long, with revolute margins, sessile or short-petiolate, the opposite pair mostly united by a somewhat membranaceous sheathing base; calyx 3 lines long, narrow-cylindrical, with acute teeth; petals slightly irregular, pinkish, exerted 1 to 1½ lines, with oblong blade erose at summit; filaments sometimes slightly dilated below the middle; capsule linear, angled, shorter than the calyx; seeds numerous.

Common along the seashore, in salt marshes, and on alkaline plains of the interior. Flowering through the summer into autumn.

24. CARYOPHYLLACEÆ. PINK FAMILY.

Herbs of inert properties, with commonly swollen nodes, simple and entire leaves always opposite, and regular perfect flowers. Calyx persistent. Corolla white, red or pink. Sepals and petals 5 (or 4), the stamens as many and alternate with the petals or twice as many, rarely fewer. Ovary superior, 1-celled (imperfectly 3-celled in some *Silenes*), with 2 to 5 styles and 1 to many ovules on a free central placenta. Fruit a few to many-seeded, 1-celled capsule dehiscent at the summit by short valves or teeth (these as many or twice as many as the carpels), or 1-seeded and indehiscent, thus becoming a nutlet or utricle. Embryo in all ours curved around the periphery of the seed, the endosperm occupying the center.

A. Fruit a capsule.

Sepals united into a 5-toothed tubular or campanulate calyx; petals narrowed below into a conspicuous claw; these with the (10) stamens and ovary frequently raised above the calyx on a stipe; stipules none; flowers mostly large and showy.

Styles 2, capsule opening by 4 short teeth; calyx with 5 prominent angles; petals not appendaged 1. VACCARIA.

Styles 3; capsule opening by 3 or 6 teeth or valves; claw of the petals commonly bearing scales or appendages at its junction with the blade 2. *SILENE*.

Styles 5; capsule coriaceous, opening by 5 teeth; calyx-teeth conspicuously prolonged; exceeding the large petals, these without appendages 3. *AGROSTEMMA*.

Sepals distinct; petals spreading, without claws or appendages, or in a few species wanting; stamens 10 or 5 or fewer; ovary not stipitate; fruit a capsule; low herbs.

Stipules none.

Petals retuse or bifid; styles 5, opposite the sepals 4. *CERASTIUM*.

Petals parted almost to the base into narrow segments; styles 3 or 4 5. *STELLARIA*.

Petals entire; styles 3 6. *ARENARIA*.

Petals entire or slightly emarginate, or none; styles 5, opposite the sepals 7. *SAGINA*.

Stipules present, scarious (setaceous in no. 11).

Petals entire; mostly conspicuous for the group.

Styles 3, distinct; leaves opposite 8. *TISSA*.

Styles 5, distinct; leaves apparently whorled 9. *SPERGULA*.

Petals minute or none.

Styles 3, short, united below; leaves opposite or in 4's, oblong or obovate 10. *POLYCARPON*.

Style short or none; leaves opposite, subulate, cuspidate. 11. *LÆFLINGIA*.

B. Fruit a utricle or nutlet.

Sepals distinct or slightly united at base; petals none or represented by mere bristle-like organs; stipules present; very small or prostrate herbs.

Annual; stipules and flowers minute 12. *HERNIARIA*.

Perennial; stipules conspicuous, silvery-scarious.

Leaves subulate; sepals very unequal, armed with a divergent spine 13. *PENTACENA*.

Leaves oblanceolate; sepals equal, cuspidate 14. *PARONYCHIA*.

1. VACCARIA Medic.

Glabrous glaucous annual with sessile exstipulate leaves and showy red flowers in a broad loose flat-topped corymb. Calyx synsepalous, ovate, with 5 prominent angles. Petals 5, clawed, not appendaged. Stamens 10. Styles 2. Ovary 1-celled but with rudimentary partitions at base. Capsule ovate, dehiscent at apex by 4 short teeth. (From the Latin *vacca*, cow, some species used for fodder.)

1. *V. vulgaris* Host. COW HERB. Two to 3 ft. high, dichotomously branching above but strictly erect; leaves ovate, 3 or 4 in. long with cordate-clasping base; flowers 7 to 9 lines long; petals red, the blade obcordate and claw linear.

European grainfield weed introduced into California: Livermore; Berkeley; Scott River Valley in northern California.

2. SILENE L. CATCH-FLY. CAMPION.

Annual or perennial herbs, more or less viscid and mostly large-flowered. Calyx tubular or inflated, 5-toothed. Petals 5, with long claws; summit of the claw commonly furnished with an entire or cleft scale or appendage, sometimes called a crown; blades spreading, entire or more commonly cleft or laciniate. Stamens 10. Styles 3, rarely 4. Capsule opening by 3 or 6 teeth at apex. (Name derived from *sialon*, saliva, the stems and other parts viscid.)

Annuals.

Flowers in cymes with unequal branches; pubescent throughout

1. *S. multinervia*.

Flowers in a compound cyme; middle of each of the upper internodes with a viscid belt, otherwise glabrous 2. *S. antirrhina*.

Flowers in a one-sided raceme; stems hirsute 3. *S. Gallica*.

Perennials.

Flowers large, 1 in. broad or more, scarlet; blade of petals deeply cleft, the segments bifid with entire or toothed lobes 4. *S. Californica*.

Flowers smaller, rose-color; blade of petals bifid to the middle, the lobes entire or bearing a very small lateral tooth 5. *S. verecunda*.

1. *S. multinervia* Wats. Erect, about 1 ft. high; pubescent throughout, viscid-glandular above; leaves linear-oblong; inflorescence cymose with unequal branches; calyx ovate in fruit, about 20-ribbed, the ribs equally prominent; petals small, purplish, without appendages, not exceeding the subulate spreading calyx-teeth.

Said to be an introduced plant; listed as an exotic by Californian authors under the name of *Silene conoidea*, but not *S. conoidea* of L. acc. to Dr. B. L. Robinson, the American authority on this family. Behavior plainly that of an immigrant but its origin unknown. Mt. Tamalpais, *Brandegee*. Frequent in Southern California.

2. **S. antirrhina** L. SLEEPY CATCHFLY. Erect, slender, sparingly branched, 1 to 1½ ft. high; leaves oblong-lanceolate or linear, 1 in. long; inflorescence paniculate; pedicels 1 in. long, more or less, filiform; flowers small; petals pink or red, the blade emarginate, 1 line long; appendages minute; capsule ovoid, 3 lines long.

Distributed throughout California but nowhere common: Mt. Shasta, *Jepson*; region of San Francisco Bay.

3. **S. Gallica** L. Erect, simple or sparingly branched, 10 to 15 in. high, hirsute or hispidulous with spreading hairs; leaves spatulate-obovate, 1 to 1½ in. long; flowers in a mostly 1-sided raceme on very short (1 to 2 lines long) pedicels; petals white or flesh-color, the blades obovate and entire and appendages small; ovary almost completely 3-celled.

Introduced from Europe, the most common species, found everywhere in fields and along roadsides. Apr.-May. The petals are commonly twisted one-fourth round or nearly so, thus resembling the fans of a turbine windmill.

S. DICHOTOMA Ehrh. Vespertine Old World annual with inflorescence dichotomous and racemose; flowers white, ½ in. broad.—Occasional in fields about Berkeley, acc. to Greene. **S. CUCUBALUS** Urbel, the Bladder Campion, another Old World weed, is naturalized at Vallejo, acc. to Greene. It is perennial with white flowers and an inflated calyx.

4. **S. Californica** Durand. INDIAN PINK. Root thick and stout, descending vertically to a depth of 1 or 2 ft.; herbage puberulent and more or less glandular; stems several, procumbent or half erect, very leafy; leaves elliptic-ovate or ovate to oblanceolate, more or less abruptly acuminate, 1 to 3 in. long; pedicels ½ to 1½ in. long; calyx 7 to 10 lines long; corolla scarlet, more than 1 in. broad; petals deeply cleft, the segments bifid with the lobes 2 to 3-toothed or the lateral smaller and entire; appendages conspicuous, with 3 or 4 minute notches; capsule ovoid, concealed until dehiscence by the broad calyx; seeds regularly papillate, the papillæ with a depression in the center.

Open woods of cañons and hillsides both in the Sierras and Coast Ranges. June.

5. **S. verecunda** Wats. Finely pubescent below, glandular-viscid above; stems several, erect or decumbent, 1 to 1½ ft. long, leafy especially near the base; leaves mostly linear-lanceolate (or those below broadly oblong), all acute; flowers terminal or borne in 3-flowered lateral cymes, the pedicels short and stout; calyx cylindric, ½ in. long, or becoming clavate or obovate as the fruit develops; calyx-teeth with membranous margins; petals 9 lines long, rose-color, the limb cleft to the middle into entire or slightly toothed oblong lobes; appendages oblong or lanceolate, obtuse and often notched at the apex.

Not common: Mt. Diablo; San Francisco Peninsula; Pt. Reyes, acc. to Davy; southward to Southern California. May-July.

3. AGROSTEMMA L.

Tall annual, sparingly branched above, with linear ex-stipulate

leaves and few long-peduncled purplish-red flowers. Calyx synsepalous, ovoid, with 10 strong ribs, the 5 teeth conspicuously prolonged into foliaceous lobes exceeding the five large entire unappendaged petals. Stamens 10. Capsule coriaceous, dehiscent by 5 teeth. (Latin, *ager*, a field, and *stemma*, a wreath, the showy flowers in ancient times made into garlands.)

1. **A. Githago** L. CORN COCKLE. Plants $1\frac{1}{2}$ ft. high; hairs long, ascending or somewhat appressed; leaves 2 to 4 in. long, $1\frac{1}{2}$ lines wide, acute; flowers solitary and long-peduncled; calyx-teeth $\frac{3}{4}$ to 1 in. or more in length, as long as the tube, and deciduous from the mature fruit; corolla nearly 1 to $1\frac{1}{2}$ in. in diameter; blade of the petals obovate, black-dotted toward the claw, entire.

European grainfield weed, the occurrence of which in California is occasionally reported. St. Helena.

4. **CERASTIUM** L. MOUSE-EAR CHICKWEED.

Pubescent herbs with exstipulate leaves and white flowers. Cymes dichotomous with herbaceous or scarious bracts. Sepals 5, distinct. Petals as many, retuse or bifid. Stamens 10 or 5. Styles 5. Capsule elongated, cylindric, often curved, usually exceeding the calyx, dehiscent at apex by 10 teeth, these erect or spreading. Seeds rough, more or less flattened. (Greek, *keras*, a horn, in allusion to the elongated curved capsules.)

Annual; petals about equaling the sepals 1. *C. viscosum*.
Perennial; petals about twice as long as sepals 2. *C. arvense*.

1. **C. viscosum** L. MOUSE-EAR CHICKWEED. Erect, 3 to 4 in. high, pilose-hirsute and somewhat glandular, especially on the calyx; leaves ovate to elliptic-oblong, sessile, slightly connate, 7 to 12 lines long; pedicels mostly shorter than the flowers; calyx divided nearly to the base into 5 sepals; petals equaling or distinctly shorter than the sepals, oblong, bifid at apex, 2 lines long; stamens 10, one or more with reduced or abortive anthers, or sometimes only 5 with anthers, the other 5 represented by mere scale-like filaments; capsule tubular, the slightly curved apex contracted, much exceeding the calyx, $3\frac{1}{2}$ lines long; seeds numerous, minutely muriculate.

Common in fields and by roadsides. Mar.-Apr. Native of Europe.

2. **C. arvense** L. FIELD CHICKWEED. Pubescent throughout; stems several from a decumbent base, very leafy at base, nearly naked above, 5 to 9 in. long; leaves linear, acute, the upper 1 to $1\frac{1}{2}$ in. long, the lowermost often but half as long; cyme contracted, bearing 1 to 5 flowers; sepals $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, scarious-margined; petals usually twice as long as the calyx, obcordate, deeply notched; capsule scarcely exceeding the calyx.

Near the coast: San Francisco Peninsula and Marin Co. Apr.-May. Var. **MAXIMUM** Hollick & Britton. (*C. pilosum* Brew. & Wats. not Ledeb.) Stout, tall, 1 to 2 ft. high; leaves elongated; inflorescence very spreading; capsule equaling to nearly twice the length of the calyx.—Point Reyes.

5. **STELLARIA** L. CHICKWEED.

Low herbs, loving moist ground or shaded habitat, with exstipulate leaves. Flowers white, small, axillary and solitary, or terminal and cymose. Sepals 5. Petals 5, parted almost to the base into narrow segments. Stamens 3 to 10. Styles 3 or 4. Capsule ovoid or oblong, relatively shorter than in *Cerastium*, dehiscent below the middle into as many or twice as many valves as there are styles. (From the Latin *stella*, a star, on account of the star-shaped flowers.)

Annual.

Stems weak, procumbent; bracts foliaceous 1. *S. media*.

Stems filiform, erect; bracts scarious 2. *S. nitens*.

Perennial; bracts foliaceous 3. *S. littoralis*.

1. ***S. media*** Cyrill. COMMON CHICKWEED. Slightly succulent, with weak procumbent stems, rooting at the lower nodes; lower leaves ovate, acute, rather abruptly contracted into slender petioles, the upper narrower, sessile; floral bracts foliaceous; pedicels slender, deflexed in fruit; petals shorter than the pubescent sepals; stamens 3, 5 or 10; styles 3.

A common weed along fence lines and ditches and shaded half-waste places generally. Feb.-May. Stems with a pubescent line, and petioles of lower leaves hairy.

2. ***S. nitens*** Nutt. Erect, with very slender stems, branching above, 3 to 7 in. high, glabrous or slightly hairy below; leaves linear, acute, sessile, 2 to 7 lines long, or the lowest ovate, 1 to 3 lines long, abruptly contracted into slender petioles nearly twice as long; inflorescence strict, the pedicels erect, $\frac{3}{4}$ in. long or less or some of the flowers quite sessile; bracts scarious; sepals scarious-margined, subulate-lanceolate, 2 lines long; petals $\frac{1}{2}$ as long as the sepals, sometimes none; capsule oblong, nearly as long as the calyx.

Grassy hillsides and plains, a somewhat obscure plant, occurring from Solano Co. southward to Southern California. Apr.-May.

3. ***S. littoralis*** Torr. Pubescent, ascending, stoutish, the stems 1 to 2 ft. long; leaves ovate, acute, rounded at the sessile base, $\frac{1}{2}$ to $\frac{3}{4}$ or 1 to $1\frac{1}{2}$ in. long; flowers in a terminal compound cyme; sepals lanceolate, acute, 2 lines long, slightly shorter than the petals; capsule included within the calyx.

Boggy or marshy spots, seacoast only: Point Lobos; Point Reyes, *Davy*; Dillon's Beach. June.

6. **ARENARIA** L. SANDWORT.

Low branching annuals or tufted or prostrate perennials with mostly lanceolate or subulate sessile often rigid leaves, without stipules. Flowers white. Sepals 5. Petals 5, entire. Stamens 10. Styles 3. Capsule globose or short oblong, dehiscent into as many entire or 2-cleft valves as there are styles. (From the Latin *arena*, sand, in which many species grow.)

Low annuals.

Leaves lanceolate, rather broad at the very base, 2 lines long 1. *A. Californica*.

- Leaves filiform, 3 to 5 lines long 2. *A. Douglasii*.
 Perennials.
 Sepals $\frac{1}{2}$ the length of the petals; palustrine 3. *A. paludicola*.
 Sepals exceeding the petals; montane 4. *A. macrophylla*.

1. ***A. Californica*** Brewer. Glabrous annual, 1 to 4 in. high, diffusely branching from the base, the stems delicate and filiform; leaves very short, slightly fleshy, 1 to 2 lines in length, obtuse; corolla 3 lines in diameter; petals oblong, $1\frac{1}{2}$ times the length of the ovate-oblong sepals; seeds small, finely roughened.

Gravelly hillslopes or disintegrating rock outcroppings in the Coast Ranges from Mt. Hamilton to Napa Co. and northward; Marysville Buttes. Apr.

2. ***A. Douglasii*** Fenzl. Annual, nearly glabrous, sometimes viscid-glandular; stems much branched, 2 to 6 in. high; leaves filiform, 3 to 5 lines long or the lowermost longer; peduncles filiform; flowers numerous, 4 to 5 lines in diameter; sepals oblong-ovate, narrowly thin-margined; petals obovate, conspicuous; capsule subglobose; valves rounded at the apex; seeds large, smooth, compressed-reniform, acutely margined.

Sterile soil of hillsides both in the Coast Ranges and Sierras. Apr.-May.

3. ***A. paludicola*** Robinson. Glabrous flaccid plant, the stems several, procumbent, rooting at the lower joints, sulcate, shining, leafy throughout; leaves linear-lanceolate, acute, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, somewhat connate, slightly scabrous upon the margins; peduncles solitary in the axils, 1 to 2 in. long, spreading or somewhat deflexed; sepals elliptic, nerveless, herbaceous, $1\frac{1}{2}$ to 2 lines long, about half the length of the obovate petals; capsule oblong, shorter than the calyx.—(*A. palustris* Wats. not of Gay.)

Swamps, Southern California to Washington. Formerly at Fort Point, San Francisco. Rarely collected.

4. ***A. macrophylla*** Hook. Puberulent perennial, with running rootstocks and ascending or erect stems, 3 to 4 in. high; leaves in 3 to 5 pairs, lanceolate or linear-lanceolate, acute at each end, more or less punctate, 1 to 3 in. long; peduncles slender, terminal or becoming axillary, 1 to 5-flowered; sepals ovate, acute or acuminate, $1\frac{1}{2}$ to 2 lines long, exceeding the petals; capsule ovoid, nearly equaling the calyx.

Shady slopes in the mountains, from Southern California to Mt. Hamilton (acc. to Davy), Mt. Diablo, and northward.

7. **SAGINA** L. PEARL WORT.

Diminutive herbs with subulate or filiform leaves without stipules. Flowers minute, terminal, often long-pediceled. Sepals 5 or 4, usually rotate-spreading in fruit. Petals white, entire or slightly emarginate, or often none. Stamens usually 5. Styles as many as the sepals and alternate with them. Capsule dehiscent to the base by entire valves. (From the Latin *sagina*, fattening, some species abundant in sheep-grazed country.)

Filiform annuals.

Sepals and petals 5; herbage nearly glabrous. 1. *S. occidentalis*.

Sepals 4; petals commonly none; herbage glandular-pubescent. 2. *S. apetala*.

Succulent perennial; flowers 5-merous 3. *S. crassicaulis*.

1. ***S. occidentalis*** Wats. Inconspicuous annual with almost capillary stems, branching at the base, erect, 2 to 5 in. high; slightly hispidulous-glandular on the calyx and upper portion of pedicel, otherwise glabrous; upper leaves broadly subulate, acute, 2 to 3 lines long, the lower filiform-linear, 3 to 6 lines long; pedicels 3 to 6 lines long; calyx and corolla 5-merous; sepals $\frac{3}{4}$ line long, the petals nearly as long; calyx rounded at the base; stamens 3 to 10; capsule $1\frac{1}{4}$ lines in length.

Not uncommon but obscure and mostly in low ground: San Joaquin and Sacramento Valleys; Napa Valley; southward to Southern California. Apr.-May.

2. ***S. apetala*** Ard. Similar to the preceding but usually glandular-pubescent; leaves linear-subulate, acute, $1\frac{1}{2}$ to 3 lines long; calyx 4-parted; petals 4, minute and obovate, or commonly none.

Introduced. North Berkeley, *Davy*.

3. ***S. crassicaulis*** Wats. Smooth perennial, the stems stoutish and succulent, branching, $1\frac{1}{2}$ to 5 in. long, decumbent; leaves linear, thickish, 2 to 9 lines long, the basal forming a rosette, the cauline connate by broad scarious membranes; flowers erect or nodding; petals and sepals subequal, $1\frac{1}{2}$ lines in length; capsule ovate, little exserted from the fruiting calyx.

Beaches along the coast from Monterey to Tomales Bay. Marin Co. June.

8. **TISSA** Adans. SAND SPURRY.

Low herbs, usually of alkaline plains, borders of salt marshes, or maritime. Leaves linear or subulate-filiform, semi-terete, with scarious stipules. Sepals 5. Petals 5, purplish or white, entire. Stamens commonly 10. Styles 3, rarely 5. Capsule 3-valved. Seeds often wing-margined. Embryo annular. (Origin of name not known.)

Erect or ascending, more or less succulent perennials with fusiform fleshy roots.

1. *T. macrotheca*.

Prostrate perennials.

Stems long and somewhat straggling, from a matted or tufted center, flowering from the middle to the ends of the branches 2. *T. rubra*

var. *perennans*.

Plants matted; flowers mostly at the ends of the branches . . . 3. *T. Clevelandi*.

Nearly or quite erect annuals 4. *T. satina*.

1. ***T. macrotheca*** (Hornem.) Britt. Stems stout, 7 to 12 in. high, erect or ascending from the short, often branched, woody crown of a very thick and fleshy taproot; herbage deep green and viscid-pubescent; leaves narrowly linear, 1 to $1\frac{1}{2}$ in. long; pedicels 3 to 6 lines long; sepals 3 to 4 lines long, scarious-margined; petals as long, pink; capsule about equaling calyx; seeds with or without a wing, even in the same capsule.

Sandy borders of salt marshes, common about San Francisco Bay.

Var. *leucantha* (Robinson) (Tissa *leucantha* Greene). Glabrous except a glandular pubescence on the looser inflorescence; flowers commonly white.—Alkaline plains of the Sacramento southward to the Livermore Valley and the San Joaquin. May–June.

Var. *scariosa* Britton (T. *pallida* Greene). Herbage pale, glandular-pubescent or almost glabrous; internodes short; stipules ovate, acuminate, 4 to 5 lines long; flowers scattered and on pedicels $\frac{3}{4}$ in. long or less, or in reduced terminal cymes.—Sea-bluffs, San Francisco to Monterey.

2. *T. rubra* (L.) Britt. var. *perennans* Greene. Stems 4 to 9 in. long, slender and wiry, many from a densely tufted base, branching little, flowering from about the middle; herbage comparatively glabrous; leaves narrowly linear, 5 lines long or less; stipules ovate, silvery-scarious, 2 lines long, very conspicuous; pedicels slender, 2 to 4 lines long; sepals oblong, acute, 2 lines long; petals reddish, about equaling the sepals; capsule not exserted from the calyx; seeds with a marginal elevation.

Beaten paths and by roadsides, infrequent: Sacramento Valley, from Redding to the Montezuma Hills; Napa Valley; Healdsburg. May. Introduced from Europe.

3. *T. Clevelandi* Greene. Perennial, viscid-glandular, the stems prostrate, forming deep-green mats 5 to 13 in. broad; leaves filiform, conspicuously fasciated in the axils, all longer than the internodes; flowers in terminal cymes; corolla 3 to 4 lines broad, white.

Sandy soil. San Francisco; San Jose, acc. to Robinson; San Diego.

4. *T. salina* (Presl.) Greene. Branching, erect or sometimes diffuse and prostrate, the stems 3 to 8 in. long; leaves narrowly linear, commonly shorter than the internodes; pedicels leafy-bracted or the upper bractless, not exceeding the capsules; sepals oblong-ovate, obtuse, scarious-margined, 2 lines long; capsule acute, longer than the calyx.

Alkaline plains of the Sacramento and San Joaquin westward to the salt marshes near the coast. May–Aug.

Var. *involutrata* (Robinson). Heads of closely aggregated flowers subtended by 2 to several foliaceous bracts.—Mt. Eden; Newark.

Var. *tenuis* (T. *tenuis* Greene). Dichotomously and copiously branched, the branches slender and internodes long; flowers very numerous, short-pedicelled, the uppermost sessile in close groups; stamens 2 to 5; capsule twice as long as the ovate-oblong sepals.—Rarely collected: Alameda, *Greene*; Hollister, *Setchell*. Apr.

9. SPERGULA L. SPURREY.

Annual. Leaves narrowly linear or subterete, apparently in whorls but rarely opposite, several others of their own size being crowded in the axils; stipules small and scarious. Flowers symmetrical. Sepals 5. Petals 5, white, entire. Stamens 10, occasionally 5. Styles 5, alternate with the sepals. Capsule 5-valved, the entire valves oppo-

site to the sepals. Embryo spirally annular. (Name from the Latin *spargere*, to scatter, in reference to the dispersion of the seeds.)

1. **S. arvensis** L. CORN SPURRY. Diffusely branching from the base; the stems 1 to 2 ft. long; pubescence of short spreading glandular hairs; leaves slightly fleshy, numerous in rather remote whorls; flowers white, 4 lines broad in a cymose panicle with strongly divergent branches; petals ovate, exceeding the sepals.

Fields and orchards, Berkeley to Monterey Co. Apr. European weed.

10. POLYCARPON L.

Low much branched annual with numerous flat leaves, small scarious stipules and very small flowers in cymes. Sepals 5, more or less carinate, scarious-margined. Petals 5, hyaline, shorter than the sepals. Stamens 3 to 5. Styles united below, very short, with 3 branches. Capsule 3-valved. Seeds several. Embryo little curved. (Greek *polus*, many, and *karpos*, fruit, in reference to the numerous pods.)

Leaves in 4's or opposite; inflorescence leafless 1. *P. tetraphyllum*.
Leaves opposite; inflorescence more or less leafy 2. *P. depressum*.

1. **P. tetraphyllum** L. Nearly glabrous, the stems prostrate 2 or 5 in. long; leaves in 4's or opposite, oblong or obovate, short-petioled, 2 to 6 lines long; cyme leafless, many-flowered, dense, the flowers nearly 1 line long or a trifle more, short pediceled; sepals green or purplish; capsule nearly equaling the calyx.

Native of Europe; established along railway lines in Napa Valley and at Vallejo. July-Aug.

2. **P. depressum** Nutt. Plants prostrate, 1 to 2½ in. broad with slender stems; leaves spatulate, varying to obovate, obtuse or acute, ½ to 2 lines long; flowers ½ as large as in the preceding; sepals little if at all keeled, about ½ line long; petals white, membranaceous, linear, ½ as long as the sepals.

Pajaro Hills, Monterey Co., collected within a few miles of the Santa Cruz Co. line, June-July, 1899, H. P. Chandler; hitherto known only from Southern California.

11. LÆFLINGIA L.

Low rigid annuals, dichotomously branched from the base, with subulate leaves and setaceous stipules. Flowers small, sessile in the axils. Sepals acuminate or awn-tipped, the outer with a tooth on each side. Petals 3 to 5, minute or none. Stamens 3 to 5. Style short or none. Capsule 3-valved, several-seeded. (Peter Læfving, Swedish traveler of the 18th Century.)

1. **L. squarrosa** Nutt. Glandular-pubescent, diffusely branched from base, 2 to 5 in. high; leaves subulate, cuspidate, squarrose-spreading; 2 to 3 lines long; capsule shorter than the sepals.

Lower San Joaquin at Oakdale; to be expected within our limits.

12. HERNIARIA L.

Ours a very small annual, with minute scarious stipules. Flowers

minute, green, in clusters, crowded, sessile. Sepals united at base. Petals and stamens as in *Paronychia*. Fruit a 1-seeded indehiscent nutlet, with a thin pericarp, enclosed in the calyx. (From the Latin *hernia*, a rupture, which one species was thought to cure.)

1. *H. cinerea* DC. Low, but erect plants, 1 to 2½ in. high, with hispidulous herbage, branched from base, the branches bearing 2-ranked branchlets; leaves oblong-ob lanceolate, 1½ to 2½ lines long; flowers in all the axils, even the lowest; calyx ½ line long, very hispid.—(*Paronychia pusilla* Greene.)

San Joaquin region at the edge of the foothills on either side of the valley; naturalized from southern Europe. May–June.

13. PENTACÆNA Bartl.

Tufted perennials with subulate pungent leaves and silvery-hyaline stipules. Flowers sessile, clustered in the axils. Sepals 5, almost distinct, very unequal, hooded, the 3 outer larger, and with a stout divergent terminal spine, the 2 inner smaller and with a shorter spine. Petals minute, scale-like. Stamens 3 to 5, inserted at the base of the sepals. Style very short, bifid. Utricle enclosed in the rigid persistent calyx. (Greek *pente*, five, and *akaina*, a thorn, the five sepals spine-tipped.)

1. *P. ramosissima* H. & A. SAND MAT. Stems prostrate, forming dense mats 5 to 18 in. broad, pubescent; leaves crowded on the stems, 3 lines long, the stipules ½ or sometimes nearly as long; calyx 1½ to 2 lines long; sepals hairy or woolly below the divergent spinose apex; utricle apiculate.

Along the entire Californian coast; common on the San Francisco sand hills. Apr.–May.

14. PARONYCHIA L. WHITLOW-WORT.

Prostrate tufted perennial, with scarious stipules and clustered flowers. Sepals 5, linear or oblong, concave or cucullate under the apex, the very tip aristate or cuspidate. Petals filament-like, or minute teeth, or none. Stamens 5, alternating with the petals when these are present, inserted on the base of the sepals. Ovary 1-ovuled. Fruit a utricle enclosed in the persistent calyx, at length bursting longitudinally. (Greek *paronuchia*, a whitlow, or felon, the name applied to an herb used as a remedy for the disease.)

1. *P. Chilensis* DC. Stems long, tough, with short internodes from a tufted crown, prostrate; leaves oblanceolate, acute, cuspidate, 2 to 4 lines long, much crowded on the branches and branchlets, especially towards the ends; stipules hyaline; flowers obviously pediceled, 3 or 4 in the axils.

Hilltops in western San Francisco; introduced from South America where it is native. Apr.–June.

25. AMARANTACEÆ. AMARANTH FAMILY.

Annual or perennial herbs with simple entire leaves with stipules.

Flowers small, usually greenish, inconspicuous, perfect or unisexual. Calyx of 3 to 5 sepals, or sometimes only 1, always persistent and more or less scarious. Corolla none. Stamens 5, sometimes fewer. Ovary superior, 1-celled, with 2 or 3 stigmas. Fruit a utricle or bursting irregularly or circumscissile. Embryo curved.

AMARANTHUS L. AMARANTH.

Coarse annual weeds with petioled leaves and small green or sometimes purplish regular flowers, disposed in axillary or terminal spikes or clusters. Flowers polygamous or monœcious, with bracts at base, staminate and pistillate flowers commonly in same cluster. (Greek a-, not, and maraino, to fade, the spikes of certain species retaining their color in drying.)

Fruit dehiscent, the top falling away as a lid.

Flowers in dense terminal and axillary spikes; sepals 5 . . . 1. *A. retroflexus*.

Flowers in small axillary clusters or spikelets;

Sepals 3; plant erect, bushy-branched 2. *A. albus*.

Sepals 3, or in the fertile flower 1; stems prostrate or ascending 3. *A. Californicus*.

Fruit indehiscent; sepals 3; plant prostrate 4. *A. deflexus*.

1. *A. retroflexus* L. ROUGH PIGWEED. Stoutish, slightly puberulent with few erect or ascending branches from the base, 1 to 2 ft. long, simple or paniculately branched above; herbage dull green, roughish or pubescent; leaves from rhombic to oblong-ovate, petioled; flowers green, densely crowded in erect or slightly spreading axillary and terminal spikes, 1 to 1½ in. long; bracts lanceolate-subulate, scarious, except the green carinate midrib, 1½ to 3 lines long; sepals 5, oblong-lanceolate, cuspidate, 1 line long or less; fruit circumscissile; seed rather less than ½ line broad, black and shining.

Very common in uncultivated orchards, gardens and waste lands.

2. *A. albus* L. TUMBLE WEED. Herbage light green; stems freely and rigidly branching, 1 to 3 or 4 ft. high, commonly of bushy outline; leaves oblong-spatulate or obovate-ovate; flowers in clusters in short axillary spikelets; bracts subulate 1 to 2½ lines long; sepals 3, oblong-lanceolate, shorter than the somewhat rugose utricle.

Summer weed; extremely abundant in cultivated fields. The plant becomes rigid when dead and dry, and when loosened by Fall winds is carried across the fields, the seeds being thus effectively dispersed.

3. *A. Californicus* Wats. Stems stoutish or rather fleshy, prostrate or ascending, branching at the base, with numerous short branchlets; leaves obovate to oblong, often with white veins and margin, 1 in. long or less, including the petiole; flowers green or reddish in many small axillary clusters; sepals 3, or in the pistillate or fertile flower 1; bracts often inconspicuous, shorter than or a little exceeding the utricle; utricle somewhat rugose, at length circumscissile.

Moist soils. South Coast Ranges.

4. *A. deflexus* L. Stems slender, prostrate, 1 to 1½ ft. long; leaves rhombic-ovate; flowers in shorter spikelets clustered in axils of leaves or disposed in dense terminal spikes 1 in. long or more; sepals 3.

Introduced from southern Europe; gardens at Berkeley; Petaluma.

26. **CHENOPODIACEÆ.** GOOSEFOOT FAMILY.

Herbs or shrubs, very often succulent or scurfy, with alternate or rarely opposite leaves, or leafless. Flowers perfect or unisexual, with an herbaceous calyx of 5 or fewer sepals, or in the pistillate flower the calyx sometimes absent. Stamens as many as the sepals, and opposite them or fewer, distinct. Ovary superior, 1-celled, containing a single ovule, becoming in fruit an achene or utricle; embryo annular and surrounding the mealy endosperm, or spiral and the endosperm lateral or wanting. *Nitrophila* has a scarious calyx and stamens not distinct.

Stems leafy.

Leaves all opposite; flowers perfect; stamens united at base into a perigynous disk 1. *NITROPHILA*.

Leaves all or mostly alternate.

Leaves plane, membranaceous, or fleshy.

Flowers perfect; calyx 5-cleft or -parted. 2. *BETA*.

Ovary partly inferior 3. *CHENOPODIUM*.

Ovary superior 4. *ROUBIEVA*.

Flowers perfect or pistillate; calyx urceolate, 3 to 5-toothed 5. *ATRIPLEX*.

Flowers unisexual; staminate calyx 4 or 5-parted; calyx of fertile flower none, the pistil enclosed by 2 bracts. 6. *SUEDA*.

Leaves subterete, linear; flowers perfect or gyno-monoecious 7. *SALICORNIA*.

Leaves reduced to mere scales; flowers perfect, immersed by 3's in the depressions of a fleshy cylindrical spike and

Decussately opposite; perianth bladder-like; herbaceous plant with stout fleshy jointed stems 8. *ALLENROLFEA*.

Spirally arranged; perianth 4 to 5-cleft; shrub with fleshy jointed alternate branchlets 9. *ALLENROLFEA*.

1. ***NITROPHILA* Wats.**

A low perennial glabrous herb with fleshy opposite amplexicaul leaves and axillary perfect flowers. Calyx of 5 (rarely 6 or 7) equal erect concave and carinate sepals. Stamens equal in number, united at base into a narrow yellowish disk. Style larger than the subglobose ovary; stigmas 2. Utricle 1-seeded, indehiscent, beaked by the persistent style, included within the connivent sepals. (Greek nitron, carbonate of soda, and philos, fond of, these plants loving alkaline soils.)

1. *N. occidentalis* Wats. Stems decumbent, 4 to 11 in. long, dichotomously branched, the internodes mostly very short; leaves linear, sessile, the lower 1 in., the floral mostly 3 to 6 lines long, triangular, mucronate; flowers solitary in the axils of the opposite leaves and bibracteate, or often 2 to 3 with the central one frequently bractless and the lateral often pedicellate; sepals imbricated, pinkish or whitish, chartaceous, 1 line long, carinate and concave, especially the 2 inner; stamens $\frac{1}{2}$ the length of the sepals and opposite them; ovule attached to base of ovary on a long funiculus.

Rare in our limits; alkaline springs, base of the Pelejo Hills, Solano Co., where it is nearly extinct; southward through the San Joaquin Valley, where it is common.

2. BETA L.

Robust glabrous biennials with large fleshy roots and alternate leaves, the radical large and long-petioled, the floral reduced and sessile. Inflorescence spicate. Flowers fascicled in the axils of the leaves or bracts, perfect. Sepals 5, sometimes costate dorsally. Stamens 5, opposite the sepals, perigynous; filaments frequently connate at base. Ovary sunk in the succulent base of the perianth and partly inferior; styles 2 or 3, short, stigmatose on the inside. Fruit included in the at length much indurated calyx. Embryo annular. (Name said to be from the Celtic, *bett*, red, on account of the color of the root.)

1. *B. vulgaris* L. BEET. Root biennial, $1\frac{1}{2}$ to 2 in. in diameter, 3 to 6 in. long, tapering downwards; stems stout, 2 to 4 ft. high, paniculately branched above; leaves 6 to 9 in. long, oblong or oval, undulate; cauline smaller, ovate-lanceolate; flowers greenish-white in sessile clusters, forming slender spikes, these disposed in a leafy panicle; seed rugose.

Marshes near Alvarado; Petaluma. An escape from gardens. June.

3. CHENOPODIUM L. GOOSEFOOT. PIGWEED.

Annual or perennial herbs, frequently white-mealy or glandular, with alternate petioled leaves. Flowers perfect, greenish, bractless and sessile, clustered in axillary or terminal spikes. Spikes often paniced. Calyx 5 (or 3 to 4)-parted, the lobes usually somewhat carinate or in fruit crested, and commonly completely covering the seed-like achene. Stamens 5 or fewer. Ovary depressed; styles 2, rarely 3 to 4, slender. Pericarp membranous, closely investing the seed. Embryo annular, sometimes incompletely so. (Greek *chen*, goose, and *pous*, foot, on account of the shape of the leaves.)

Annual; calyx parted into lobes or segments.

Finely mealy, not pubescent or glandular; perianth dry, closely persistent on the seed; embryo annular.

Erect, herbage light green 1. *C. album*.

Diffuse, herbage dark green 2. *C. murale*.

Not mealy, glandular-pubescent and aromatic; fruit seed-like, small, included in the dry perianth; embryo curved.

Leaves slender-petioled; fruit imperfectly enclosed; spikes cymose-diverging, leafless 3. *C. Botrys*.

Leaves slightly petioled; fruit perfectly enclosed.

Spikes dense, leafy 4. *C. ambrosioides*.

Spikes more elongated, leafless 5. *C. anthelminticum*.

Neither glabrous nor mealy; flowers in dense short axillary spikes; perianth more or less fleshy in fruit, enclosing the utricle; embryo annular 6. *C. rubrum*.

Perennial; calyx merely toothed or cleft, more distinctly synsepalous, in fruit dry; leaves broadly triangular; spike terminal, leafy only below; fruit seed-like, exserted; embryo annular 7. *C. Californicum*.

1. *C. album* L. PIGWEED. WHITE GOOSEFOOT. Commonly 2 to 4 ft. high, erect, usually paniculately branched; herbage more or less light green or white-mealy; leaves rhombic-ovate, sinuate-dentate below or about the middle, the uppermost varying to lanceolate, and subentire, 1 to 2 in. long, whiter beneath than above; flowers densely

clustered in close spikes, the panicle strict and close or somewhat spreading; calyx about $\frac{3}{4}$ line wide in fruit, the lobes strongly carinate.

A very common European weed in half cultivated lands, flowering in late summer and early autumn.

2. **C. murale** L. NETTLE-LEAVED GOOSEFOOT. Rather stout and succulent, the loose branches decumbent and ascending, 8 to 15 in. long; herbage dark green, the growing parts very finely mealy; leaves rhombic-ovate, irregularly and sharply toothed above the base, 1 to $1\frac{1}{2}$ in. long; flowers in rather dense axillary or terminal spicate panicles; panicles leafless, or nearly so; fruiting calyx closed; seed acutely margined.

Naturalized from Europe; a common weed in old yards and waste places, flowering through the winter.

3. **C. Botrys** L. JERUSALEM OAK. Glandular pubescent and viscid throughout; leaves slender-petioled, ovate to oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, obtuse, truncate or cuneate at base, sinuately pinnatifid and the lobes usually toothed; spikes cymose, diverging, loose, leafless; perianth not completely enclosing the fruit.

Waste places near dwellings and in stream beds; naturalized from Europe and widely distributed but not common. Stockton; Vacaville; Winters; Kelseyville; Russian River; Coyote Creek, between San Jose and Gilroy. July–Sept.

4. **C. ambrosioides** L. MEXICAN TEA. Glabrous, scarcely glandular; when young sometimes tomentose-pubescent; 2 to $3\frac{1}{2}$ ft. high, usually stout and branched; leaves slightly petioled, oblong or lanceolate, 2 to 5 in. long, repand-toothed or nearly entire, the upper tapering to both ends; flowers in dense, axillary clusters upon the branches, forming a leafy spike; calyx-lobes obtuse, appressed; styles 3, sometimes 4; pericarp deciduous.

Common near salt marshes and abundant along interior streams; mostly autumnal. Alameda; West Berkeley; Ross Valley; Napa River; Suisun Marshes; Sacramento River.

5. **C. anthelminticum** L. WORMSEED. Resembling the preceding; sometimes perennial(?); herbage light green, glandular-puberulent and highly aromatic; leaves sinuate-serrate or the lower sometimes lacinate-pinnatifid, $2\frac{1}{2}$ or mostly 1 in. long, or less; inflorescence a terminal mostly leafless panicle of dense but elongated slender spikes; sepals not carinate, enclosing the fruit; seed smooth and shining, obtusely margined.

Not so common as the last, but appearing to hybridize with it. Alameda; Benicia; Lower Sacramento; Lake Co.

6. **C. rubrum** L. COAST BLITE. Stem angled, erect, 1 to 2 ft. high; herbage green or nearly so; leaves lanceolate-oblong to broadly ovate, coarsely sinuate, 1 to 2 in. long; flowers numerous in dense short axillary spikes; calyx-lobes 2 to 4, rather fleshy; stamens 1 to 2; seeds shining, the margin acute.

Sparingly naturalized from Europe. Andrus Island, Lower Sacramento; Alvarado Marshes. Sept.

7. **C. Californicum** Wats. SOAP PLANT. Stout, erect or decumbent at base, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high from a very large simple or branched root; herbage green, scarcely at all mealy; leaves broadly triangular, truncate or cordate at base, or subhastate, sharply and unequally sinuate-dentate, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, on petioles 1 to 4 in. long; flowers in dense clusters of 8 or 9, the clusters disposed in a simple terminal spike, leafless or leafy at the very base; calyx campanulate, barely exceeding 1 line in length, 5-lobed; lobes broadly oblong, obtuse, denticulate at apex; pericarp persistent; fruit seed-like, large, subglobose, or somewhat compressed, exserted, $\frac{3}{4}$ to 1 line broad; embryo completely annular.

Wooden Valley Grade near Mt. George, Napa Co.; Loma Prieta, *Davy*; Hollister, *Setchell*; Pacific Grove, *Tidestrom* (whose specimens show fruiting spikes over 1 ft. long); southward to Southern California, where it is very common. Apr.-May. A root of a plant taken from the Berkeley Hills in 1896 showed 3 strong tap-like branches below the depressed caudex, descending vertically over 2 ft.; two of these were simple, the third branched; all measured at their greatest diameter 8 to 9 in. in circumference. The most northerly locality recorded is the Marysville Buttes, *Jepson*, 1891.

4. ROUBIEVA Moq.

Heavy-scented herb, with prostrate branches. Leaves alternate, deeply pinnatifid. Flowers minute, perfect or pistillate, solitary or 2 or 3 together in the axils; calyx deeply urceolate, 3 to 5-toothed, becoming saccate and contracted at the top, enclosing the fruit. Stamens 5, included. Ovary glandular at the top; styles 3, somewhat lateral, exserted. Pericarp membranaceous, glandular-dotted, thin and deciduous; seed vertical, lenticular; embryo annular.

1. **R. multifida** Moq. Branches 1 to 2 ft. long; leaves $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; calyx in fruit obovate, very conspicuously reticulate-veined. —(*Chenopodium multifidum* L.)

Native of Peru; first reported from Plumas Co. (prior to 1880); in recent years become abundant on the San Francisco sand hills, and in waste places about West Oakland, Vallejo, and Napa; also at Vacaville, where it was first noticed in 1891.

5. ATRIPLEX L.

Herbs or shrubs, usually mealy or scurfy with bran-like scales. Leaves alternate or opposite. Flowers monœcious or dioecious, in clusters, or mostly short spikes which are either simple or panicle, the pistillate and staminate in separate inflorescences or mingled in the same cluster (androgynous); staminate with a regular 4 or 5-parted calyx, the pistillate consisting of a pistil enclosed between a pair of appressed foliaceous bracts, without perianth. Bracts either free or united, much enlarged in fruit, the margin becoming more or less dilated or foliaceous and the sides thickened, indurated, muricate or variously appendaged. (The ancient Latin name of these plants derived originally from the Greek.)

Annuals somewhat succulent and mealy; leaves petioled, the lower at least 1 in. long; bracts distinct or nearly so, ovate to rhombic.

Leaves mostly lanceolate; fruiting bracts 4 to 6 lines long. . . . 1. *A. patula*.
 Leaves triangular-hastate or deltoid; fruiting bracts $1\frac{1}{2}$ to 2 lines long. . . .

2. *A. hastata*.

Leaves triangular-ovate; fruiting bracts 1 line long. . . . 3. *A. spicata*.
 Annuals, not succulent; leaves less than 1 in. long (except no. 7); bracts more or less united and indurated and nut-like in fruit, the sides smooth, toothed or appendaged.

Prostrate, decussately branched throughout; leaves mostly less than $1\frac{1}{2}$ lines long. . . . 4. *A. depressa*.

Erect or ascending, not decussately branched throughout.

Leaves cordate-ovate, sessile. . . . 5. *A. cordulata*.

Leaves oblong-lanceolate to ovate, short petiolate or mostly sessile. . . .

6. *A. coronata*.

Leaves broadly or deltoid-ovate, the lower petiolate; plant 2 to $3\frac{1}{2}$ ft. high.

7. *A. expansa*.

Perennials.

Interior species of alkaline flats.

Diffuse; leaves mostly dentate. . . . 8. *A. bracteosa*.

Erect and rather rigid; leaves entire. . . . 9. *A. fruticulosa*.

Seaboard species.

Stems prostrate, wiry; fruiting bracts membranous, compressed. . . .

10. *A. Californica*.

Stem reclining, stout; fruiting bracts spongy, globose. . . 11. *A. leucophylla*.

1. *A. patula* L. Stout and succulent, erect, 10 to 18 in. high, with few ascending branches; herbage green, only the growing parts somewhat mealy; leaves (the lowest often opposite) lanceolate or linear, sometimes with hastate base; inflorescence more or less leafy at base; bracts rhombic-ovate, thick and subcoriaceous, 4 to 6 lines long or more.

Salt marshes about San Francisco Bay; common.

2. *A. hastata* L. Rather slender, with long (1 to $2\frac{1}{2}$ ft.) ascending branches; herbage mealy, scarcely succulent; leaves triangular-hastate or deltoid, entire or sinuate-dentate, 1 to 2 in. long, often as broad or broader, on petioles 3 or 4 lines long; flowers in dense terminal and lateral spikes 1 (or 2) in. long; fruiting bracts triangular-ovate, $1\frac{1}{2}$ (or 2) lines long.

Common at the edges of salt marshes about San Francisco Bay. Bracts very variable as to size and either much or little toothed, or entire. Lateral angles of the deltoid leaves often prolonged into salient lobes.

3. *A. spicata* Wats. Annual, erect, 12 to 16 in. high; herbage scurfy, the stem below glabrate; leaves triangular-ovate, $\frac{1}{2}$ to 1 in. or more long, irregularly dentate or entire, cuspidate, on petioles 1 to 6 lines long; inflorescence a panicle of spikes; flowers androgynous, the clusters dense on the often long ($\frac{1}{2}$ to $3\frac{1}{2}$ in.) spikes; staminate calyx 4-sepalous; bracts of pistillate flowers nearly concealed by the male flowers, ovate, acute, coherent at base, free at apex, in fruit little enlarged, and about 1 line long.

Low alkaline tracts bordering the Sacramento River marshes near Main Prairie, Solano County, *Jepson*, July 5, 1891, and southward to Livermore, *Greene*. The leaves of seedlings and of the young plant coarsely and irregularly sinuate-toothed. Spikes sometimes very

loose. The species occasionally exhibits a tendency to become diœcious. **Var. LAGUNITA.** Very slender, simple, 5 to 8 in. high; fruiting bracts $1\frac{1}{2}$ lines long.—Lagoon Valley, Solano Co., Sept. 1891.

4. A. depressa Jepson. Annual, prostrate, grayish-scurfy; stems slender, 1 to 4 in. long, decussately branched throughout; leaves opposite, sessile, broadly ovate, acute, a line or two long; flowers in the axils of the opposite leaves in clusters of 4; these and the subtending leaves crowded on the branchlets, the internodes at time of flowering a line long or less; fruiting bracts ovate-hastate, acute, wingless, or the pair of hastate lobes representing the wing.

Low saline spots, base of the Pelejo Hills, Solano Co. Remarkable among our species for its decussate branching and prostrate habit. The inflorescence is androgynous, commonly 2 staminate and 2 pistillate flowers in each cluster. The bracts are seldom partially distinct even at the apex, the sides smooth.

5. A. cordulata Jepson. Widely and oppositely branched at base, alternately and sparingly so above, 7 to 15 in. high, the branches commonly virgate, erect or ascending; herbage scurfy throughout; leaves sessile, cordate-ovate, 3 or 4 lines long; flower-clusters in all the axils, consisting of both staminate and pistillate flowers; calyx tomentously-scurfy and deeply 4-cleft; fruiting bracts semi-orbicular, $1\frac{1}{2}$ to 2 lines broad, much compressed, sessile or short-stipitate, the margin with acute teeth, the terminal tooth commonly the largest, the sides smooth or the lower bearing one or more tooth-like projections.

Near Vacaville, Solano Co.; low plains of the San Joaquin south of Stockton. July–Aug. The androgynous clusters are commonly of 3 staminate and 3 to 5 pistillate flowers.

6. A. coronata Wats. Rather stout, scurfy, 1 ft. high; leaves oblong-ovate, the larger 8, the smaller 4 lines long, contracted at base to a short petiole, or sessile; flowers in axillary clusters, androgynous; bracts of the pistillate flower sessile or shortly pedicellate, strongly compressed, surrounded by a gash-toothed herbaceous margin nearly as broad as the body, the sides rarely muriculate.

First collected in 1862 by Brewer (no. 1189) in or near Livermore Pass; nothing quite like the original specimens have since been discovered, but these are merely robust branches broken off a young plant. I take *A. verna* Jepson to be the same specifically and the plants so called are now to be known as

Var. verna. Annual, low, only 3 to 6 in. high, sometimes rather stout, white-scurfy throughout; branches simple or nearly so, two or three pairs opposite at base, the upper alternate; leaves oblong-lanceolate or ovate, sessile, 3 to 5 lines long; flowers androgynous in the axils of the leafy stems, two or three in a cluster; calyx deeply 4-cleft; stamens 4; fruiting bracts orbicular, compressed, 2 lines long, the margins crenate-dentate.—Collinsville, *Jepson*; Antioch, *Mr's. Brandegee*; and southward to saline flats near San Felipe, Santa Clara Co., *Setchell and Jepson*. May–June.

7. A. expansa Wats. Annual, erect, much branched, 2 to $3\frac{1}{2}$ ft.

high; herbage closely and finely mealy-scurfy; leaves 1 to 3 in. long, broadly ovate or deltoid-ovate, irregularly and sharply sinuate-toothed, the lower on stout petioles 9 or 10 lines long and strongly 3-nerved from the base, the upper reduced to sessile and more or less cordate floral bracts as broad or broader than long; flower clusters showing a tendency to become unisexual, the staminate flowers in the lower clusters more or less sterile; fruiting bracts numerous, clustered in the axils of the leaves, sessile, orbicular, mostly 3-nerved, 2 lines long, $2\frac{1}{2}$ to 3 lines broad, usually emarginate at apex, the wing sharply toothed, partly distinct, and commonly bearing on one face a few irregular projections or crests.—(*A. trinervata* Jepson.)

Low alkaline areas from the base of the Coast Range foothills of northwestern Solano Co. southeastward to the lower San Joaquin, where it is a weed in the grain fields near the river. Recent specimens from Solano Co. seem to indicate that the plants there are more or less dioecious. *A. nodosa* Greene, Pitt. i. 40, is unmistakably a monstrous form of this species, perhaps due to insect stings. A specimen from near Stockton, *Dary*, matches in some of its branches the abnormal branches and inflorescence of *A. nodosa*; the remaining branches are typical *A. expansa*!

8. *A. bracteosa* Wats. Perennial, more or less diffuse, with stems 1 to several ft. long; branches smooth and shining, straw-yellow; foliage finely grayish-scurfy; leaves oblong-ovate, acute, 4 to 9 lines long, thin, sharply but sparingly toothed or the smaller entire; flower clusters unisexual, the staminate in terminal submoniliform spikes, the pistillate axillary; fruiting bracts a line long, the margin laciniately toothed or simply dentate and the central tooth lanceolate and conspicuous.

Sacramento, *Michener*; Andrus Island and Tyler Island, Lower Sacramento, *Jepson*; Antioch, *Mrs. Brandegee*; and southeastward through the San Joaquin Valley to Kern Co., where it is common.

9. *A. fruticulosa* Jepson. Perennial; herbaceous or suffrutescent below, erect, 6 to 13 in. high, and branched from the base, the stems simple below, with terminal branchlets; herbage grayish; leaves sessile, lanceolate or narrowly oblong, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; staminate flowers in dense globose clusters 2 lines in diameter, the clusters in a terminal simple or sometimes slightly branched spike, naked or nearly so; pistillate chiefly below, from the leaf axils; calyx deeply 5-cleft, occasionally unequally parted and one lobe reduced; fruiting bracts orbicular, $1\frac{1}{2}$ to 2 lines broad, the margins partly free, the sides tooth-crested; seed nearly a line broad.

Leesville, Colusa Co.; alkaline flats near the Little Oak Ranch, Solano Co., *Jepson*; Antioch, *Mrs. Brandegee*, June 8, 1892. The name not well chosen, but the first specimens with perennial woody stems 3 to 6 in. high.

10. *A. Californica* Moq. Finely white-mealy or somewhat glabrate in age; the hue of the herbage mostly greenish; root large and somewhat fleshy; stems slender, wiry, mostly herbaceous, prostrate, often much branched and forming a thick mat; leaves thinnish,

ovate-lanceolate to oblong-lanceolate, 2 to 6 lines long, sessile, or narrowed at base into a very short petiole; staminate flowers in terminal spikes; pistillate flowers in axillary clusters; fruiting bracts membranous, ovate, acute, entire, loosely closed over the utricle, but not united, $1\frac{1}{2}$ lines long or less.

Not uncommon on sandy beaches from Point Reyes and about San Francisco Bay, southward to Santa Cruz, *Setchell*, and Santa Monica, *Alderson*. Apr.-May. Roots cylindrical or fusiform, $\frac{1}{2}$ to 1 in. thick and $1\frac{1}{2}$ to 4 in. long.

11. *A. leucophylla* Dietr. Stems prostrate, densely light brown-scurfy, 1 to several ft. long, often somewhat woody at base, with usually many short ascending branches; leaves thick, orbicular to elliptic or elliptic-ovate, 4 to 8 lines long, sessile, 3-nerved; calyx rather large, 5-cleft; staminate clusters in a dense terminal spike $\frac{1}{2}$ to 1 in. long; pistillate flowers 2 or 3 together in axillary clusters; fruit globose or nearly so, $1\frac{1}{2}$ to 2 lines long, with the bracts completely united and marginless (except at the apex where there is a small ovate double wing) and the sides commonly with two (or several) warty projections.

Seabeaches, very common; San Francisco and southward. Said by *Greene* to be diœcious; it may sometimes be. Tips of the ovate wing of the bract commonly spreading.

6. ALLENROLFEA O. Kuntze.

An alkaline shrub with alternate leafless jointed branches; the branchlets fleshy and green with short scale-like leaves. Flowers perfect, arranged spirally by threes in a crowded spike, in the axils of fleshy subsessile bracts. Calyx of 4 (or 5) concave carinate imbricated sepals, more or less united. Stamens 1 or 2, with slender filaments at length exerted. Ovary oblong, axial; styles 2, rarely 3, commonly distinct. Pericarp membranous, free from the vertical oblong seed. Embryo green, nearly surrounding the rather copious albumen. (Named for Allen Rolfe, a member of the botanical staff at Kew, England.)

1. *A. occidentalis* O. Kuntze. KERN GREASEWOOD. Erect, diffusely branched, 4 ft. high or less; vestiges of leaves very short, broadly triangular and amplexicaul, acute, often nearly obsolete; spikes numerous, sessile or nearly so, cylindrical, 3 to 10 lines long; bracts rhomboidal; flowers crowded, slightly exerted; calyx becoming spongy and enclosing the fruit.—(*Spirostachys occidentalis* Wats.)

Alkaline soil in the Livermore Pass, *Setchell* and *Jepson*, 1896; abundant in strongly alkaline soil about Byron Springs, *Davy*, 1898. Frequent in the Great Basin and upper San Joaquin but of rare occurrence in western California.

7. SALICORNIA L. SAMPHIRE. GLASSWORT.

Low saline very succulent plants, ours herbs, with leafless jointed stems and opposite branches. Inflorescence spicate-cylindrical. Flowers perfect, immersed in the hollows of the thickened

upper joints, and disposed in opposite clusters of 3, the lateral ones of each trio often only staminate. Calyx small and bladder-like, with an anterior opening, formed of 2 sepals laterally placed and united above and below, in fruit spongy or thickened on the margins. Stamens 2, exserted in flower. Ovary oblong; styles 2 to 3, short, free. Pericarp membranous, in our species adherent to the vertical seed. Endosperm small; embryo thick. (Name from sal, salt, and cornu, horn, plants of saline habitat with horn-like branches.)

1. *S. ambigua* Michx. PICKLE-WEED. Stems 5 to 12 in. long, from woody rootstocks, erect or decumbent and rooting at the joints; herbage greenish; spikes slender, terminal, not thicker than the sterile portions of the stem, short-jointed, the scales short; flowers nearly equal in height; seed $\frac{1}{3}$ line long.

Very abundant in salt marshes about San Francisco and Suisun Bays. *S. Californica* Jepson, of the Upper San Joaquin Valley, has intercalary spikes much thicker than the sterile portions of the stem.

8. *SUÆDA* Forsk. SEA BLITE.

Fleshy plants of salt marshes or alkaline plains, with alternate subterete linear leaves. Flowers perfect, or perfect and pistillate on the same plant, sessile in the axils of the leafy bracts, minutely bracteolate; calyx 5-parted, fleshy, enclosing the utricle and mostly carinate or crested. Stamens 5. Styles 2 or 3, short and rather thick. Seed with a black, shining, crustaceous testa and a spiral embryo, the radicle exterior. (Name from the Arabic.)

Succulent, woody only at base; branches decumbent, with ascending branchlets; flowers 1 to 3 in the axils. 1. *S. Californica*.
Mostly suffrutescent, with erect main stem and ascending branches; flowers 5 or 6 in the axils. 2. *S. Torreyana*.

1. *S. Californica* Wats. Glabrous and slightly glaucous; main stem or woody trunk short, $\frac{1}{2}$ ft. high, 1 to $1\frac{1}{2}$ in. in diameter, giving rise to decumbent branches 3 to 9 ft. long; these woody for 1 or 2 ft., then succulent, bearing ascending or erect branchlets $\frac{1}{2}$ to 1 ft. long, and forming low circular plants 6 to 12 ft. in diameter; leaves spreading or somewhat recurved, densely crowded upon the branchlets, broadly linear, acute, 6 lines long; flowers large, 2 lines broad, 1 to 3 in the axils; when 3 the central one perfect, the 2 lateral smaller and pistillate; perianth deeply cleft, the lobes with narrow, scarious margins, not cucullate-appendaged; pericarp at maturity thin and watery; seed vertical, $\frac{1}{2}$ line broad, notched at the lower end, the testa jet-black, smooth and brittle.

Sandy beaches bordering San Francisco Bay; rarely collected. San Pablo Landing, *Bolander*; abundant on Bay Farm Island, *Jepson*. Sept.-Oct. The flowers are decidedly protogynous, the two or three stigmas being exserted between the tips of the calyces before the flower expands. The ovary is surmounted by a short thick column, the styles arising from the concavity of the cup-shaped summit of the column. The herbage quickly blackens in drying or when broken, as commonly in the genus.

2. **S. Torreyana** Wats. Thickly branched plant of bushy habit, about 2 ft. high, the central stem erect, and the (6 to 14 in. long) branches ascending or suberect, a woody base 5 to 12 in. high persisting through the winter; leaves linear, subterete, narrow at base, 5 to 7 lines long, mostly acute, the floral similar; clusters several (mostly 7)-flowered; perianth rather deeply cleft, the lobes often somewhat thickened at the apices and incurved or slightly cucullate, with narrow scarious margins; seed vertical, $\frac{1}{2}$ line broad, dark brown, smooth and shining.

Alkaline soil, Livermore Pass, *Jepson*, June, 1896; Byron Springs, *Hansen*, Sept., 1899. Branches mostly flexuous, or somewhat crooked. Main stems rarely depressed, with prostrate branches. Ovary and styles similar to the foregoing.

27. NYCTAGINACEÆ. FOUR-O'CLOCK FAMILY.

Ours succulent herbs with opposite entire petioled leaves and swollen joints. Flowers perfect, delicate. Involucre of several distinct bracts subtending a many-flowered head, or calyx-like and containing 1 to many flowers. Petals none. Calyx tubular, colored like a corolla, 4 to 5-lobed, its persistent base constricted over the 1-celled 1-seeded superior ovary, forming a hardened pericarp-like covering to the achene. Stamens 3 to 5, slender, hypogynous or perigynous. Embryo coiled, with broad foliaceous cotyledons, the endosperm in the center.

1. ABRONIA Juss.

Ours perennial seaside herbs with viscid herbage. Peduncles axillary or terminal, bearing a many-flowered head subtended by 5 to 15 distinct involucre bracts. Flowers showy. Calyx salver-form. Stamens commonly 5, unequal, included in the tube and adnate to it. Style included. Persistent base of calyx indurated, 3 to 5-winged, more or less reticulate, enclosing a cylindrical achene. Embryo with one cotyledon. (Greek abros, graceful.)

Calyx rose-purple; wings thin but solid 1. *A. umbellata*.
Calyx yellow; wings thicker, the central cavity of the fruit extending through them 2. *A. latifolia*.

1. **A. umbellata** Lam. COMMON SAND-VERBENA. Stems slender, prostrate, viscid, 1 to 3 ft. long; leaves nearly glabrous, roundish or ovate to narrowly oblong, the margin often somewhat sinuate, 1 to $1\frac{1}{2}$ in. long, narrowed at base to a slender petiole; heads 10 to 15-flowered, peduncles 2 to 6 in. long; involucre bracts narrowly lanceolate, 2 or 3 lines long; calyx rose-purple, 6 to 8 lines long; lobes 5, emarginate; fruit rigid and hard, oblong, attenuate at each end, 4 to 5 lines long; wings thin, broadest above and often truncate, narrowed to the base. Common on the whole California seacoast. June-Oct.

2. **A. latifolia** Esch. YELLOW SAND-VERBENA. Very succulent; stems stout, 1 to 2 ft. long, prostrate, only the leaves and flowering peduncles ascending or erect; leaves broadly ovate to suborbicular

and broader than long, truncate or reniform at base, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; petioles longer than the leaves; peduncles usually exceeding the leaves; bracts 5, broadly ovate, 2 lines long; flowers somewhat fragrant; calyx yellow, $\frac{1}{2}$ in. long, the limb 5-lobed and the lobes emarginate; fruit coriaceous, 4 to 6 lines long, acute at each end; wings 4 to 6, commonly 5.

Common along the seashore from Monterey northward; also at West Berkeley. May–Nov.

28. PORTULACACEÆ. PURSLANE FAMILY.

Low herbs with succulent entire leaves and regular flowers. Calyx chorisepalous (synsepalous in *Portulaca*). Sepals 2 (or in *Lewisia* 4 to 8), fewer than the petals. Petals 3 to 16, often 5. Stamens 3 to 20, sometimes more numerous. Ovary superior; styles 2 to 8, united below or distinct, stigmatic along the inside. Fruit a 1-celled capsule, dehiscent from the apex by 2 or 3 valves, or circumscissile, the top falling away as a lid.

Sepals 2, united below and partly adherent to the ovary, the free upper portion deciduous; capsule circumscissile, opening at the middle by a lid.

1. *PORTULACA*.

Sepals 2 to 8, distinct and free from the ovary, persistent; capsule circumscissile near the base, the upper deciduous part splitting from below.

2. *LEWISIA*.

Sepals 2, distinct and free from the ovary, persistent.

Flowers racemose or axillary; capsule 3-valved, style-branches 3.

Petals mostly red, showy; stamens mostly 5 or more. 3. *CALANDRINIA*.

Petals mostly white or pinkish; stamens 3 to 5. 4. *MONTIA*.

Flowers in scorpioid spikes; capsule 2-valved; sepals more or less scarious. 5. *CALYPTRIDUM*.

1. *PORTULACA* L.

Fleshy prostrate annual with alternate leaves and yellow flowers. Calyx 2-cleft, the tube adnate to the ovary below. Petals 5 (rarely 6), inserted with the stamens on the calyx. Stamens 7 to 20. Style mostly 3 to 8-parted. Fruit a 1-celled globose capsule, opening transversely, the upper part coming off like a lid. Seeds many. (Old Latin name.)

1. *P. oleracea* L. COMMON PURSLANE. Glabrous; leaves cuneate or obovate; flowers sessile, opening only in sunshine.

Common in low lands: Napa Valley; Lake Co.

2. *LEWISIA* Pursh.

Acaulescent fleshy perennials with very thick farinaceous root bearing a rosulate cluster of leaves and short 1-flowered scapes. Flowers large and handsome. Sepals (in ours) 6 to 8, herbaceous, persistent. Petals (in ours) 12 to 16, varying from white to red. Stamens (in ours) numerous. Style-branches 3 to 8, filiform, stigmatic their whole length. Capsule circumscissile near the base, the upper deciduous part more or less valvate-cleft from the base. (In honor of Capt. Lewis of the Lewis & Clarke expedition across the continent, who collected the following species.)

1. **L. rediviva** Pursh. BITTER ROOT. Leaves thick, linear; scapes 1 or 2 in. high, jointed above the middle and bearing an involucrel whorl of 5 or 7 scarious subulate bracts; petals pink or bright rose, $\frac{3}{4}$ to 1 in. long, spreading rotately.

Mt. Hamilton; Mt. Diablo; high peaks east of Napa City (acc. to Greene); Sonoma and Napa ridge, "number of style-branches in 4 flowers examined=3, 4, 6, 7," *Brewer*; the only known localities within our limits. It is the "Racine d'Amère" of the French trappers of the Rocky Mountains of the Northwest where it is common and an article of food among the Indians. May.

3. **CALANDRINIA** HBK.

Low fleshy annuals with alternate leaves and ephemeral red or rose-colored flowers, rarely varying to white. Sepals 2, persistent. Petals 3 to 7. Stamens 5 or more, rarely 3, seldom of the same number as the petals. Style-branches 3. Capsule 3-valved from the apex. Seeds numerous, black and often shining. (J. L. Calandrin, Swiss botanist.)

Capsule enveloped by the fruiting calyx; branches mostly ascending or erect;
 var. *Menziesii* of 1. *C. caulescens*.
 Capsule nearly twice as long as the fruiting calyx; branches mostly trailing .
 2. *C. Breweri*.

1. **C. caulescens** HBK. var. **Menziesii** Gray. RED MAIDS. Branching from the base and more or less diffuse, or erect and simple, 2 or 3 to 18 in. high; leaves narrowly oblanceolate to linear, acute; calyx glabrous, or somewhat hispidulous on the margin or midrib of the sepals; petals 5, orbicular-obovate, retuse at apex, crimson or rose-red, 3 or 4 lines long; stamens 7 to 13, commonly 10 to 12, rarely fewer than 7; capsule ovate, short-pointed, enveloped by the sepals which are nearly or quite as long.—(*C. Menziesii* T. & G.)

Sometimes in fields and pastured hills; in wet years very abundant in orchards and vineyards, often occupying such exclusively and behaving like an immigrant. Mar.—Apr.

2. **C. Breweri** Wats. Stems lax, trailing or sometimes ascending, nearly 1 to quite 2 ft. long; leaves spatulate or oblong-spatulate; flowers sparse; pedicels longer than in no. 1, often deflexed in fruit; capsule narrower and longer (5 lines long), at length nearly twice as long as the calyx.

Near summit of Mt. Tamalpais, *Jepson*; Santa Inez Mountains (where first collected by *Brewer*). June.

4. **MONTIA** L. INDIAN LETTUCE.

Moderately succulent, very glabrous and often glaucous, low herbs. Leaves mostly radical. Flowers white or pinkish, rarely rose-color, usually reopening the second or third day. Sepals 2, persistent. Petals 5 (in *M. fontana* 3), equal or somewhat unequal, distinct or more or less connate at base. Stamens 5 or 3. Style-branches 3. Capsule 3-valved from the apex. Seeds 2 or 3.

Leaves all radical, except a sessile and often united opposite cauline pair under the inflorescence; petals 5, retuse or notched, equal.

Cauline pair of leaves distinct; perennial 1. *M. Sibirica*.

Cauline pair connate-perfoliate into a roundish or angular disk; petals white, little surpassing the calyx; rather coarse annual 2. *M. perfoliata*.

Cauline pair partially joined on one side, rarely on both; petals pink, about 3 times the length of the calyx; rather slender annual 3. *M. gypsophiloides*.

Cauline pair broadly to narrowly lanceolate, distinct or connate on one side; petals white, 1 to 2 lines long; dwarfish annual 4. *M. spathulata*.

Stems bearing many alternate small leaves; petals 5, notched, often somewhat unequal.

Perennial by stolons or bulblets; stems simple and peduncle-like 5. *M. parvifolia*.

Annual; stems diffuse and dichotomous 6. *M. diffusa*.

Stems bearing opposite leaves; petals 3, unequal, connate at base into a sympetalous corolla which is split down one side 7. *M. fontana*.

1. *M. Sibirica* (L.) Howell. Erect, 9 to 18 in. high; radical leaves long-petioled, blades ovate, acuminate or barely acute, 1 to 2 in. long; cauline pair ovate or obovate to almost orbicular, distinct and sessile, or short-petioled; raceme very lax, the flowers on long ($2\frac{1}{2}$ in. or less) pedicels; sepals ovate, obtusish; petals pink with 5 longitudinal rose-purple lines, emarginate at apex, 4 lines long, narrowed at base into a distinct claw.—(*Claytonia Sibirica* L.)

Swampy places along the coast. Marin Co., northward to Mendocino. Feb.

2. *M. perfoliata* (Donn.) Howell. MINER'S LETTUCE. Usually 4 to 10 (sometimes 16) in. high; radical leaves long-petioled, the earliest narrowly linear, the later ones ovate, rhomboidal or deltoid; cauline pair completely united into a round and entire or angulately 2-lobed disk, $\frac{1}{2}$ to 4 in. broad; flowers in pairs, threes or fascicles, in a short-peduncled or sessile more or less interrupted raceme; petals white, little surpassing the calyx.—(*Claytonia perfoliata* Donn.)

Everywhere common in orchards or vineyards and in the shade of Oak and other trees in the foothills and cañons. Feb.—June.

Var. *nubigena* (*Claytonia nubigena* Greene). Compact plant with glaucescent herbage, and numerous stems; leaves linear or a few spatulate at apex; racemes dense; flowers white or pinkish, twice as large as in the species.—Marin Co.; Mt. Diablo.

3. *M. gypsophiloides* (F. & M.) Howell. Slender, 2 to 9 in. high, the branches erect or ascending; herbage very pale and glaucous; radical leaves linear or filiform, the flowering stems 2 to several times as long; cauline pair ovate to linear-lanceolate, partially united on one side; raceme slender, elongated; flowers for their size showy and most delicately beautiful; petals pink, cuneate-obovate, retuse, about 3 times as long as the sepals.—(*Claytonia gypsophiloides* F. & M.)

Northward slopes and summits of the Coast Ranges from Mt. Diablo, *Brewer*, *MacLean*, to Mt. Tamalpais; Napa Co.; Healdsburg and northward. Last of Mar. to early May.

4. *M. spathulata* (Dougl.) Howell. Densely caespitose, 1 to $2\frac{1}{2}$ in. high, the herbage glaucous and very fleshy; leaves linear or slightly dilated above, nearly terete; cauline leaves lanceolate, nearly dis-

tinct or somewhat connate upon one (rarely on both) sides, nearly equaling the short raceme; sepals much shorter than the petals, these somewhat quadrangular, retuse or rounded at apex, short-clawed, white or very light pink, with darker pink markings at base of blade; corolla 4 lines broad; anthers vermilion.—(*Claytonia spathulata* Dougl.)

Common on gravelly or rocky hill tops (often in vineyards and other cultivated areas) from the Oakland Hills and San Francisco northward along the coast and as far eastward as the summit of the mountains bounding Napa Valley. Feb.—Mar.

5. *M. parvifolia* (Moc.) Greene. Stems at base bearing clusters or tufts of ovate or obovate petioled leaves, $1\frac{1}{4}$ in. long or less; above the somewhat caudex-like base the stems are slender with scattered small (2 to 4 lines long) leaves and are, therefore, peduncle-like; sepals roundish, 1 line long; petals scarcely unequal, obovate or oblanceolate, emarginate, rose-color or white, 4 or 5 lines long; capsule mostly 1-seeded.

North Coast Ranges; Sierra Nevada from Yosemite, *Bolander*, northward. Thought to be perennial; certainly propagating by bulblets formed in the leaf axils.

6. *M. diffusa* (Nutt.) Greene. Diffusely dichotomous, the stems 5 to 8 in. high, leafy and flower-bearing throughout; leaves deltoid-ovate, the upper oblong-ovate, contracted at base into a petiole as long; racemes numerous, few-flowered; pedicels very slender; petals emarginate, white or rose-color, 2 lines long, surpassing a little the calyx; seeds covered with fine elevated lines crossing each other at right angles.—(*Claytonia diffusa* Nutt.)

Coniferous woods: Mill Valley, Marin Co., acc. to Brandegee; Humboldt Bay. Rarely collected in California.

7. *M. fontana* L. WATER MONTIA. Annual; stems slender 2 to 6 in. long, ascending or procumbent; leaves opposite, narrowly oblanceolate or oblong, somewhat connate at base; petals minute, white, unequal, united at base into a sympetalous corolla which is split down one side and exceeds little the calyx; seeds minute, roughened.

Growing along the margin of small surface streams or in muddy places. Marin Co. to Napa Co., and northward. Mar.—May.

M. CHAMISSONIS (Esch.) Greene, is an opposite-leaved species of the higher Sierras; 3 to 5 in. high; petals 5, 3 times the length of the calyx.

5. CALYPTRIDIMUM Nutt.

Depressed and rather succulent herbs with alternate spatulate leaves and small ephemeral flowers in solitary or clustered scorpioid spikes. Sepals 2, scarious or scarious-margined, orbicular, emarginate at apex and base. Petals in ours 4, obovate; stamens 1, 2, or 3, twice the length of the petals. Style simple; stigmas 2. Capsule membranaceous, globose-ovate, 2-valved, few to many-seeded. (Name derived from kaluptra, a calyptra, the petals closing over each other and carried up on the capsule.)

- Stamens 1, 2, or 3, shorter than the petals; style very short or almost none 1. *C. quadripetalum*.
 Stamens 3, twice as long as the petals; style very long, filiform 2. *C. umbellatum*.

1. *C. quadripetalum* Wats. About 9, in. high; branches erect from a decumbent base, leafy up to the short dense spikes; leaves oblong-spatulate, 2 in. long or less, including the tapering petiole; sepals round-reniform, white-scarious and rose-tinged with greenish center, 2 to 4 lines broad, exceeding the 4 petals; capsule oblong-oval, 10 to 20-seeded, little or not at all surpassing the fruiting calyx.

Near the Geysers in Sonoma Co., acc. to Greene; first coll. by Torrey in 1864 in Lake Co.; later (1884) by Rattan on the head waters of the Eel in northern Lake Co.

2. *C. umbellatum* (Torr.) Greene. PUSSY'S PAWS. Radical leaves spatulate in a dense rosette; peduncles 1 to 7 in. high; sepals wholly scarious or with a mere greenish center emarginate at apex and base, equal; petals 4, obovate; 2 stamens opposite petals, the third alternate, these and the long styles exserted; capsule globose-obovate, few-seeded.

Near Santa Cruz, *Anderson*; Humboldt Co.; frequent in the Sierra Nevada. June-Sept.

29. FICOIDEÆ. CARPET-WEED FAMILY.

Ours prostrate or decumbent herbs. Flowers perfect and regular, either solitary or clustered. Calyx 4 to 5-lobed or -parted, either free from or more or less adnate to the ovary. Stamens hypogynous or commonly perigynous, fewer than the sepals or more numerous. Fruit a loculicidal or circumscissile capsule or indehiscent.

Calyx free from the ovary; petals none; leaves opposite.

Capsule loculicidal, 3-valved; sepals 5, white inside; stamens 3 to 5 1. MOLLUGO.

Capsule circumscissile; calyx 5-cleft.

Stipules scarious, laciniate; ovary 1-celled; stamens 1 to 3.

2. CYPSELEA.

Stipules none; ovary 3 to 5-celled; stamens numerous 3. SESUVIUM.

Calyx adnate to the ovary.

Petals none; leaves alternate, plane; fruit indehiscent 4. TETRAGONIA.

Petals numerous; leaves opposite, 3-sided and very fleshy; fruit dehiscent 5. MESEMBRYANTHEMUM.

1. MOLLUGO L. CARPET WEED.

Low much-branched annuals with whorled leaves and obsolete stipules. Flowers axillary, on slender pedicels. Sepals 5, scarious-margined, white within, thus resembling petals when expanded, persistent. Petals none. Stamens 5, hypogynous and alternate with the sepals, or 3 and alternate with the cells of the ovary. Stigmas 3. Capsule 3-celled, 3-valved, loculicidally dehiscent, the partitions breaking away from the many-seeded axis. (Ancient Latin name.)

1. *M. verticillata* L. INDIAN CHICK-WEED. Prostrate, form-

ing patches, glabrous, not fleshy; leaves obovate or spatulate, entire, clustered in whorls of 5 or 6, unequal, 7 lines long or less; flowers several at each node; sepals oblong; capsule ovoid, scarcely exerted from the calyx; seeds reniform, shining, nearly smooth, obviously striate, crowded in the capsule and irregularly distending its walls which are thus roughened.

Naturalized in California but not yet common: Healdsburg, Alice King, 1897, the only reported Bay Region locality; Los Angeles, Davidson, 1893; upper Sacramento, Brewer, 1862.

2. CYPSELEA Turp.

Inconspicuous prostrate herb with opposite leaves and scarious laciniate stipules. Tube of calyx short, campanulate, the lobes (in ours) 5, ovate, unequal. Petals none. Ovary superior, 1-celled; style 2-cleft. Fruit a subglobose circumscissile capsule. Seeds minute, smoothish, the funiculi persistent on the central placenta. (Greek kupsele, a beehive, which the capsule is thought to resemble.)

1. *C. humifusa* Turp. Stems much branched and matted; leaves 2 to 6 lines long, oblong or elliptical, obtuse, the petioles slender, nearly as long as the blade, those of each pair very unequal; stamens 3, rarely 1, inserted opposite the sinuses.

West Indian weed naturalized in low lands: Lower San Joaquin; Santa Cruz (acc. to Syn. Fl.). Aug.

3. SESUVIUM L.

Fleshy decumbent or prostrate herbs with opposite leaves and no stipules. Flowers solitary in the axils, sessile or shortly pediceled. Calyx-tube turbinate, the lobes 5, purplish, oblong, obtuse. Petals none. Stamens (in ours) numerous, inserted on the calyx, united by their filaments into sets. Ovary 3 to 5-celled, with as many separate styles. Capsule membranous, the upper part falling off as a lid. Seeds smooth. Embryo annular.

1. *S. sessile* Pers. LOWLAND PURSLANE. Stems prostrate, freely branching, 1 to 3 ft. long; herbage finely warty; leaves broadly spatulate, $\frac{3}{4}$ to 2 in. long; flowers 4 to 5 lines long; sepals ovate-lanceolate, commonly acuminate, 3 lines long; filaments united for about one-half their length.

River lowlands and alkaline fields in the San Joaquin Valley: Banta, Delano, etc. May-Aug.

4. TETRAGONIA L. SEA SPINACH.

Succulent perennial herb with alternate plane leaves. Flowers axillary, greenish, apetalous. Calyx 4-lobed, adnate to the 3 to 9-celled ovary. Stamens 1 to many, perigynous. Fruit a hard or bony nut, indehiscent, enveloped by the calyx which bears several horn-like protuberances. (Greek, tetra, 4, and gonu, knee or angle, alluding to the fruit.)

1. *T. expansa* Murr. NEW ZEALAND SPINACH. Branches procumbent or prostrate; leaves rhombic-ovate, entire, 4 to 5-nerved

beneath, 1 to 2½ in. long, abruptly contracted at base to a broad petiole, the surface covered with crystalline papillæ; flowers sessile, 1 to 3 in each axil; calyx-lobes widely spreading, yellowish within; fruit 4-horned, 4 to 6 lines long.

Beaches of San Francisco Bay: Alameda and Marin Cos. and South San Francisco.

5. MESEMBRYANTHEMUM L. FIG MARIGOLD.

Ours glabrous perennial herb. Stems and leaves very succulent, the latter opposite, without stipules. Flowers axillary and terminal. Calyx-tube adnate to the ovary, the lobes unequal and foliaceous. Petals linear, very numerous, inserted with the innumerable stamens on the tube of the calyx. Ovary in ours 10 to 12-celled, the styles as many as the cells of the ovary and distinct or nearly so. Capsule becoming baccate, dehiscing in rainy weather by stellate valves at the flattened summit. Seeds minute, numerous. (Corruption of the Greek mesembria, midday, and anthemion, blossom.)

1. *M. æquilaterale* Haworth. SEA FIG. Stems several ft. long, the plants often forming extensive mats; leaves 3-sided, with nearly flat faces, thicker than broad, 1½ to 2 in. long; flowers terminal, sessile or shortly peduncled, fragrant and showy (1½ to 2 in. broad); petals bright rose-purple; styles 6 to 10.

Dunes and cliffs near the sea from Bodega Bay and Marin Co. southward to San Diego. Known to students of the University of California as "Faculty Onions." The fruits, which "taste like salted apples," are eaten by schoolboys in Southern California (H. P. Chandler).

30. CALYCANTHACEÆ. SWEET-SHRUB FAMILY.

Aromatic shrubs with opposite entire leaves and no stipules. Flowers large, solitary, terminating the branches. Bracts, sepals and petals passing into each other, imbricated in many series, adnate at base to the enlarged hollow receptacle which is like a rose-cup. Stamens numerous, the inner ones sterile. Pistils many, distinct, nearly enclosed in the hollow receptacle, becoming achenes.

1. CALYCANTHUS L.

Flowers livid red. Petals in several rows at mouth of tube, the inner ones shorter. Styles equaling the anthers, filiform, colorless. Seed without endosperm; cotyledons foliaceous, convolute. (Greek kalyx, covering or calyx, and anthos, flower.)

1. *C. occidentalis* H. & A. WESTERN SWEET-SCENTED SHRUB. Erect branching shrub 5 to 9 ft. high; leaves ovate to oblong-lanceolate, acute at apex, rounded at base, 1½ to 6 in. long; sepals and petals linear-spatulate, 1½ in. long or less, the upper ½ or ⅓ fading tawny or brown in age or in drying; filaments about ½ line long; fruiting calyx cup-like, 1½ in. long; achenes oblong, somewhat velvety-hirsute, nearly 3 lines long.

Along streams in cañons of the Coast Ranges from Sonoma, Napa Valley and Vacaville northward. Last of May-July.

31. LAURACEÆ. LAUREL FAMILY.

Trees and shrubs, with alternate simple leaves and no stipules. Flowers perfect, regular. Petals none. Anthers opening by uplifted valves. Ovary simple and superior. Fruit a berry or drupe.

1. UMBELLULARIA Nutt.

Foliage highly aromatic, evergreen. Flowers in simple pedunculate umbels, covered in the bud by an involucre of 6 caducous bracts, each flower except the central one with a similar bract and sometimes with two lateral bractlets at the base of the pedicel, the bract and bractlets caducous. Sepals 6. Stamens 9, the three inner with a stipitate orange-colored gland on each side of the filament at base and alternating with scale-like staminodia; anthers 4-celled, 4-valved, the three inner extrorse, the outer introrse. Ovary 1-celled, 1-ovuled, with a single style. Fruit a subglobose or ovoid drupe.

1. *U. Californica* Nutt. MOUNTAIN LAUREL. Tree 20 to 30 ft. high or more with a dense crown of erect slender branches; leaves oblong, entire, tapering rather more to the apex than to the base, 4 in. long, on petioles 2 to 3 lines long; peduncles in the terminal axils, 4 to 7 lines long; umbels 4 to 9-flowered, the bracts orbicular to ovate; sepals $1\frac{1}{2}$ lines long, the stamens included and borne on their united base; pedicels in flower 2 or 3 lines long, in fruit somewhat elongated and noticeably turbinate-thickened beneath the drupe; drupe 1 in. long, greenish and mottled with white dots before maturity, changing into light red or aging into brown-purple.

Throughout California, mainly along mountain streams, more rarely in the valleys. The Mountain Laurel is usually a good-sized tree in the cañons, but it ascends the most rocky slopes or declivities and appears in a reduced form at considerable elevation as bush-like clumps; or again, it may be seen in the hills on abrupt north slopes, forming dense thickets of limited area, with sapling-like stems and presenting a remarkably even surface above as if clipped like a garden hedge. The leaves may persist 4 or 5 years; the new shoots begin to grow in June. It is found in flower from Dec. to Mar. The drupes fall in Nov. or Dec.; scattered over the ground beneath the trees they look not unlike nearly ripe olives. It is also called Bay Tree, Spice Tree and (in the North Coast Ranges) Pepperwood.

32. CERATOPHYLLACEÆ. HORNWORT FAMILY.

Aquatic submerged fragile herbs, with cylindric jointed stems and whorled sessile exstipulate leaves cut into filiform divisions. Flowers minute, axillary, monocious, without perianth but surrounded by an 8 to 12-cleft persistent involucre. Staminate flowers crowded, of a single fleshy anther, dehiscing irregularly. Ovary superior,

1-celled, with a single ovule. Fruit indehiscent, beaked by the slender persistent style, spinose or tuberculate at base. Embryo with highly developed plumule. No endosperm.

1. CERATOPHYLLUM L.

The only genus. (Name from the Greek, *keras*, a horn, and *phyllon*, a leaf, the leaves cut into slender rigid divisions.)

1. *C. demersum* L. HORNWORT. Stems slender, $\frac{1}{2}$ to 2 ft. long; leaves in whorls of 6 to 8, the segments prickly-dentate, $\frac{1}{4}$ to 1 in. long; style as long as the achene; this 1 to 2 lines long, with a spine or reflexed horn on each side near the base.

Ponds and lakes: Santa Cruz, San Francisco, and northward. Aug. Seldom collected in fruit; achene variable, the margin winged or wingless and the sides sometimes crested or covered with tubercles.

33. NYMPHÆACEÆ. WATER-LILY FAMILY.

Aquatic perennial herbs with horizontal rootstocks or with tubers. Leaves floating or erect, peltate or deeply cordate. Flowers large, solitary, perfect, on long peduncles. Sepals 3 to 12. Petals 3 to many. Stamens 6 to numerous, hypogynous. Carpels 3 to many, united into a single pistil with many cells, or distinct.

To this order belong the Water Lilies, the Pond Lilies, the Water Chinquapin of the Eastern United States, and the Sacred Indian Lotus. Besides two species of Pond Lilies we have in California the Water-shield, *Brasenia peltata*, which has tuberous rootstocks, peltate leaves, flowers $\frac{1}{2}$ in. long, and distinct pistils; it has been found near Stockton (fide Greene) and Clear Lake (Jepson).

1. NUPHAR Sibth. & Smith. POND LILY.

Aquatic or subterrestrial plants. Scapes from creeping rootstocks rooting from beneath and bearing on the upper side the scars of former petioles. Leaves in ours cordate with rounded lobes and narrow or closed sinus; petioles long. Sepals 5 to 12, conspicuous, orbicular, concave, mostly petal-like, unless at base or on the outside. Petals 10 to 20, small and thick, bearing more or less resemblance to staminodia. Stamens hypogynous, numerous, densely imbricated around the ovary, at length recurving; anthers linear; filaments very short. Ovary 10 to 25-celled, the stigmas radiating upon its truncate or disk-like summit. Fruit coriaceous-baccate. (Name thought to be from the Arabic.)

Sepals 6 to 7; anthers yellow; stigmatic rays 13 to 22 1. *N. advena*.
 Sepals 5 to 12; anthers dark red; stigmatic rays 15 to 24 2. *N. polysepalum*.

1. *N. advena* Soland. YELLOW POND LILY. Rootstock horizontal, creeping; leaves 6 to $9\frac{1}{2}$ in. broad, 9 to 13 in. long, floating or raised above the water on stout subterete petioles; calyx $1\frac{3}{4}$ (when fully expanded, 2 to 3) in. in diameter; sepals 6 or 7, the inner narrowed at base, yellow, the three outer smaller and greenish; petals

about 15, nearly or quite concealed beneath the many stamens; stamens in 5 or 6 series; anthers yellow; stigmatic rays 13 to 15 or 22, usually not reaching the edge of the disk; neck beneath the disk scarcely constricted.

Sloughs near Stockton, *Sanford*, *Setchell* and *Jepson*; flowering in summer.

2. **N. polysepalum** Engelm. INDIAN POND LILY. Leaves as in the preceding, the sinus $\frac{1}{3}$ to $\frac{1}{2}$ the length of the blade; calyx subglobose or somewhat cup-shaped, 3 (or when fully expanded 4 to 5) in. in diameter; sepals 9 to 12, yellow or brownish-red; petals 12 to 18, 6 lines long, 4 lines broad, nearly or quite concealed beneath the many stamens; anthers dark red; stigmatic rays 15 to 24; fruit subglobose, $1\frac{1}{2}$ in. in diameter, with short constricted neck and convex disk.

Near Santa Cruz, *Hartweg* (in 1846), to Marin Co. and northward in the mountains. Flowering in summer. The seeds were used as an article of food by the Klamath Indians.

34. RANUNCULACEÆ. BUTTERCUP FAMILY.

Herbs with alternate or radical leaves, excepting Clematis, a shrubby climber with opposite leaves. Flowers solitary or in terminal racemes or panicles, with the parts all free and distinct. Sepals more than two, usually 5, often petal-like. Petals usually 5 or more, but sometimes minute or altogether wanting. Stamens indefinite, usually numerous. Pistils several, each 1-celled, bearing a single style. Fruit an achene, follicle or berry. Seeds containing abundant endosperm and a minute embryo. The leaves are mostly palmately divided or lobed and in all cases exstipulate, but the petioles often have a broad sheathing base. The flowers are regular, except in Delphinium and Aconitum, and most frequently have a pronounced convex receptacle. Aconitum Fischeri, of the High Sierras, has the upper sepal conspicuously hooded and concealing the upper 2 petals, the lower 3 petals being obsolete or minute. All our genera are common to the Eastern United States and to Europe. This is a widely diffused order to which belong many choice garden plants and very many medicinal herbs.

Flowers complete.

Fruit a follicle.

Petals red, roundish, concave, inserted on a fleshy disk adnate to the base of the calyx. 1. PÆONIA.

Petals all spurred. 3. AQUILEGIA.

Upper sepal spurred; petals 4. 4. DELPHINIUM.

Fruit an achene.

Sepals spurred; petals small, white; achenes numerous on a slender spike-like receptacle; diminutive herbs. 7. MYOSURUS.

Sepals not spurred; petals plane, yellow or white; achenes capitate. 8. RANUNCULUS.

Fruit a berry.

Flowers very small, whitish, in a short raceme. 10. ACTÆA.

Flowers incomplete; petals wanting.

Sepals petal-like.

Stem leafy; fruit a follicle. 2. ISOPYRUM.

Leaves all radical, except an involucrel whorl of 3; fruit an achene.

Leaves all opposite; sepals 4; fruit a feathery-tailed achene; woody climber.

Flowers small, greenish, paniced, in ours diceious; achenes few.

6. ANEMONE.
5. CLEMATIS.
9. THALICTRUM.

1. PÆONIA L.

Perennial herbs with ternately divided leaves. Flowers large, solitary and terminal. Sepals and petals 5 or 6, the latter and the numerous stamens borne on a fleshy disk, adnate to the base of the calyx. Style short or none. Follicles 2 to 5, thick and leathery, several-seeded. (Paion, the physician of the gods.)

1. *P. Brownii* Dougl. PEONY. Somewhat fleshy plant about 8 in. high; leaves glaucous or pale, ternately or biternately divided, chiefly radical, the lobes obovate to linear-spatulate; peduncles 1 or 2 in. long; petals plane, dull brownish-red, thick and leathery, scarcely longer than the roundish concave sepals; disk of many thick fleshy lobes; follicles mostly 5, broadly oblong, smooth, 1 to 1½ in. long.

A rare herb within our limits: Santa Cruz, Mrs. A. E. Bush, 1880; attributed to Marin Co. by Behr. More frequent southward: San Antonio, *Hartweg*; Paso Robles, Cahunanga Pass; Temescal Range, *Brewer*; San Bernardino. In the Sierras from at least Placer Co. northward. May.

2. ISOPYRUM L.

Low glabrous slender perennials with ternately compound leaves, 2 to 3-lobed petiolulate leaflets and axillary or terminal white flowers. Sepals 5, petal-like. Petals none. Stamens 10 to 40. Follicles 5 to 10, oblong or ovate, 2 to several-seeded. (Isopyron, the Greek name of a species of *Fumaria*.)

1. *I. occidentale* H. & A. Plant of delicate habit; stems from a cluster of slender fusiform roots, branching above, 6 to 10 in. high; leaflets 5 to 6 lines long, with 2 or 3 broad rounded lobes, glaucous beneath; flowers white, 6 to 9 lines in diameter; follicles 5 to 9, narrowly oblong, obliquely pointed, transversely veined, 6 lines long; seeds 8 to 9, wrinkled.

A rare herb of shady places in the lower mountains. Sierra Nevada: Forest Hill, *Bolander*; Mariposa, *Congdon*. Coast Ranges: Weldon Cañon, Vaca Mountains, *Jepson*. Mar-Apr. First collected by Douglas in the Coast Ranges, the exact station unknown. Greene's var. *coloratum* (*Erythra*, i, 125), with rose-red flowers, is from the Gabilan Mountains.

3. AQUILEGIA L.

Perennial herbs with ternately compound chiefly radical leaves, petiolulate leaflets and showy solitary flowers. Sepals 5, plane, colored like the petals. Petals 5, all alike and produced backward into large hollow spurs projecting below the calyx. Stamens numerous, some inner ones sterile with dilated filaments, appearing like scarios scales. Pistils 5, becoming several-seeded follicles. (Deriva-

tion doubtful, said by some to be from the Latin *aquila*, an eagle, on account of the claw-like spurs.)

1. **A. truncata** F. & M. COLUMBINE. Glabrous, 2 to 3½ ft. high; leaves biternate, the leaflets roundish in outline, broadly cuneate at base, at summit incised, the segments lobed or crenately toothed; petioles long, those of the radical leaves 1 ft. long; flowers scarlet, tinged with yellow, pendulous in anthesis; spurs, therefore, erect, ¾ in. long, somewhat exceeding in length the widely spreading sepals, and truncate at the orifice, the blade being almost none; follicles nearly 1 in. long, conspicuously veined, the long styles persistent.

Moist, shaded places in the lower hills, or at middle altitudes in the mountains, almost throughout California; not in the inner Coast Ranges. May-June.

4. DELPHINIUM L. LARKSPUR.

Herbs, ours perennial, with palmately divided leaves. Flowers in terminal racemes. Sepals 5, irregular, the upper one produced into a spur at the base. Petals 4, in pairs, with small spreading usually oblique blade on a claw of about equal length, the upper developed backward into nectary-bearing spurs and concealed within the spur of the calyx. Pistils in ours 3, seldom more, becoming many-seeded follicles. (Greek *delphinion*, larkspur, derived from *delphin*, the flowers of some species resembling the classical figures of the dolphin.)

Flowers blue, white, pink or lavender-color.

Roots woody-fibrous or fusiform-thickened.

Lower leaves 4 to 7 in. in diameter; flowers whitish; sepals externally villous all over. 1. *D. Californicum*.

Leaves mostly 1 to 3 in. in diameter; sepals finely pubescent or nearly glabrous, not villous.

Racemes commonly rather short and few-flowered; pedicels spreading; sepals 7 to 10 lines long. 2. *D. variegatum*.

Raceme commonly elongated and many-flowered; pedicels erect; sepals 4 to 7 lines long. 3. *D. hesperium*.

Root a more or less globose tuber.

Follicles ½ in. or less long, erect; flowers usually small. 4. *D. decorum*.

Follicles ½ in. or more long, widely spreading; flowers few and large. 5. *D. Menziesii*.

Flowers red. 6. *D. nudicaule*.

1. **D. Californicum** T. & G. COAST LARKSPUR. Stout, 2½ to 7 ft. high, sparsely pubescent, many-leaved; leaves very large, 4 to 6 in. broad, 2 to 4 in. long, deeply parted into 3 to 5 segments; segments incised, sinuses of the primary divisions mostly closed in the lower leaves, open in the upper; racemes dense, ¾ to 1½ ft. long; pedicels 4 to 7 lines long, or the lowest somewhat more; bractlets very long and slender; flowers rather densely pilose-pubescent, white or whitish or somewhat purplish inside, never fully expanded; upper petals entire or very slightly emarginate with a woolly tuft at apex on the inside; lower pairs bifid, woolly on the outside; spur mostly longer than the sepals; follicles oblong, turgid, hardly if at all diverging.

Throughout our region toward the coast, but not common, flowering in Mar. and Apr. San Francisco, *Bolander*, 1865; Berkeley Hills, *Greene*, 1883; lower petioles often 8 to 10 in. long.

2. *D. variegatum* T. & G. SACRAMENTO LARKSPUR. Commonly about $1\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, more or less hispidulous toward the base; leaves dissected into oblong mostly obtusish mucronulate diverging segments; raceme few (about 1 to 10)-flowered, loose, with ascending or spreading pedicels usually 1 in. long or more, the lower pedicels sometimes much elongated; sepals deep but bright blue, 7 to 12 lines long; spur stoutish, the tip often slightly curved; lower petals large, elliptic or roundish, commonly colored like the sepals; upper petals obliquely oblong, whitish; capsule oblong, rather turgid, 7 to 10 lines long, hispid-pubescent; seeds with brownish-winged angles.

Monterey, north to Contra Costa Co., Napa Valley, and the upper Sacramento Valley. Apr. The var. *apiculatum* Greene, has many flowers on shorter pedicels in a compact cylindrical raceme.—Lower Sacramento Valley, especially low foothills bordering the Coast Ranges.

3. *D. hesperium* Gray. WESTERN LARKSPUR. Root a cluster of short thickened fibers, or of a single much thickened and somewhat elongated woody root; stems and leaves with a short more or less appressed pubescence, commonly simple, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; leaves 2 to 3 times palmately cleft into oblong or linear spreading segments; raceme rather dense, virgate, 6 to 12 in. long; pedicels 4 to 8 lines long, or the lowest 1 in., strictly erect; flowers blue, pink or white and running into various intermediate shades; sepals 4 to 6 lines long, equaled or exceeded by the straight spur; petals little shorter than the sepals, the lateral pair emarginate or shortly cleft; follicles short oblong, 3 to 5 or sometimes 7 lines long, pubescent; seeds wing-margined.

Dry ground in open places, flowering at the beginning of the dry season, last of May or in June. Especially common in the interior and in the inner Coast Ranges, less frequent near the sea: Vacaville; Mt. Tamalpais; Berkeley; San Mateo Co.; Coyote Creek (south of San Jose). Typically the single stem terminates in an elongated cylindric raceme. The lower flowers of the inflorescence are sometimes somewhat remote from those of the raceme proper and on longer stalks, solitary, or 2 together, showing a tendency to become subpaniculate below. Further, late rains sometimes induce lateral flowering branches: plants from Forest Grove, Santa Cruz Mountains, above Los Gatos, June, 1896, had solitary strictly virgate main stems, about 2 ft. high, which had passed out of flower and fruited; from the axils of the radical and subradical leaves flowering branches were later produced.

D. recurvatum Greene has the linear-oblong sepals conspicuously recurved; it belongs to the low-lying lands along the San Joaquin and is at present insufficiently known.

4. *D. decorum* F. & M. Perfectly glabrous, except a slight pubescence on the branchlets and sometimes on the pedicels; radical and subradical leaves thick, often somewhat succulent, roundish in outline, 3 to 5-parted into broadly cuneate segments, 1 to $1\frac{1}{2}$ in. long; segments subentire, or 3-cleft or -lobed, the lobes acute or obtuse;

upper leaves pedately 3 to 5 or rarely 7-parted into linear-oblong lobes; racemes mostly many-flowered, 4 in. long or less; pedicels slender, spreading, $\frac{1}{2}$ to 1 or 2 in. long; flowers purple-violet; sepals oval, 5 to 8 lines long, equaled by the spur; petals oblique, 2-cleft, the upper whitish, purple-veined, glabrous, smaller than the lower; lower pubescent, especially above; mature follicles thickish, oblong, 5 to 6 lines long, erect, or the tips spreading; seeds rough-papillose.

Common in open woods: Vaca Hills, *Platt*; Napa Valley; Berkeley. Earliest leaves shallowly 3 to 5-lobed, the lobes broad and rounded. Raceme often with a few branches at base or inclined to be corymbose.

5. **D. Menziesii** DC. Root a cluster of roundish connected tubers; herbage commonly pubescent; stems often flexuous, about 1 ft. high, leafy below; leaves parted, the divisions mainly cleft, long-petioled; raceme loose; flowers few, on long ascending pedicels; pedicels in fruit often 2 in. long; sepals $\frac{1}{2}$ to $\frac{3}{8}$ in. long, the slender spur of equal length; follicles at maturity $\frac{1}{2}$ to $\frac{3}{4}$ in. long, almost always widely recurving.

Northern California; "San Mateo Co. and northward," *Greene*.

6. **D. nudicaule** T. & G. RED LARKSPUR. Stems 1 ft. high or more, few-leaved or quite naked; leaves somewhat succulent, little divided, the divisions with short obtuse lobes; racemes loose and open; pedicels 2 to $3\frac{1}{2}$ in. long; calyx bright scarlet, 1 in. long; petals partly or mostly yellow, the upper narrowly obovate, sharply notched at summit, much larger than the small cleft lower ones; follicles glabrous, divergent at summit.

Banks of rivulets and high rocky summits: Santa Lucia Mountains to the region of San Francisco Bay, Napa Valley, Vacaville and northward. Apr.

5. CLEMATIS L. VIRGIN'S BOWER.

Stems woody at base, climbing by aid of the petioles of the opposite leaves. Sepals 4, valvate in the bud, white and petal-like. Petals none. Stamens numerous. Achenes numerous in a head, the styles persistent as hairy or plumose tails, very conspicuous in fruit. (Ancient name, from Greek *klema*, a twig.)

Leaflets 3; flowers large, solitary or 3 together 1. *C. lasiantha*.
 Leaflets 5 to 7; flowers smaller, in panicles 2. *C. ligusticifolia*.

1. **C. lasiantha** Nutt. PIPE-STEM. LARGE-FLOWERED CLEMATIS. Branchlets and sepals tomentose-pubescent, the foliage less so; leaves trifoliolate, elliptic to orbicular in outline, truncate or rounded at base, above 3-lobed and coarsely toothed, 1 to 2 in. long; flowers polygamous, solitary or 3 together, on bibracteolate peduncles 2 in. long, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. in diameter; sepals broadly oblong; achenes 2 lines long, supporting a tail 1 in. long or more, the fruit of one flower forming a head-like cluster 2 to $2\frac{1}{2}$ in. broad.

In the hills, clambering over low shrubs and often illuminating cañon sides with its profusion of flowers. Coast Ranges; Santa Clara Co.; San Mateo Co.; Marin Co.; Berkeley; Napa Valley; Gates'

Cañon, Vaca Mountains; Marysville Buttes; Sierra Nevada. Apr.-May.

2. *C. ligusticifolia* Nutt. VIRGIN'S BOWER. HILL CLEMATIS. Nearly glabrous, except the inflorescence; leaflets 5 to 7, ovate, cordate or obtuse at base, 3-lobed or coarsely laterally toothed about midway, or nearly entire; flowers 2 in. in diameter; panicles borne on axillary peduncles 2 in. long; fruiting panicles 6 to 15 in. long.

Almost throughout California, in the hilly districts, from San Bernardino north to Santa Cruz: San Jose; Marin Co.; Ukiah; and Weldon Cañon, Vaca Mountains; Sierra Nevada. June-July. Fr. Sept.-Oct.

6. *ANEMONE* L. WIND-FLOWER.

Perennial herbs, the stems and radical leaves from a horizontal root-stock. Cauline leaves none except an involueral whorl of 3, usually distant from the solitary or umbellate flowers. Sepals 5 or more, petal-like, imbricate. Petals none. Stamens numerous. Achenes numerous, merely pointed. Seed suspended. (Greek *anemos*, wind, the flowers disturbed by the wind.)

1. *A. quinquefolia* L., var. *Grayi* (Greene). Stems slender, 4 to 12 in. high; radical leaf of reniform outline, trifid; involueral leaves 3-foliate, leaflets elliptic or obovate in outline, entire at base, the lateral usually somewhat oblique, crenately toothed or incised, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; flowers white, 6 to 8 lines broad; sepals about 6; achenes tapering into the short recurving style.—(*A. nemorosa* L. var. *Grayi* Greene. *A. Grayi* Kell. & Behr.)

Shady mountain woods: Santa Cruz Mountains; Tamalpais. Mar.-Apr.

7. *MYOSURUS* L.

Dwarf annuals with entire tufted radical leaves and naked 1-flowered scapes. Sepals 5, spurred at base. Petals 5, with a nectar-bearing hollow at the summit of the slender claw. Stamens 5 to 20. Achenes numerous, crowded on a long and slender spike-like receptacle. Ovules attached near the summit of the cell. (Greek *mus*, a mouse, and *oura*, a tail, in allusion to the curious receptacles.)

Flowers on scapes; achenes with an appressed beak 1. *M. minimus*.
Flowers sessile, the spike-like receptacles in a close cluster; achenes with a spreading beak 2. *M. alopecuroides*.

1. *M. minimus* L. MOUSE TAIL. Leaves linear-filiform; scapes 3 to 6 in. high, the slender receptacles $\frac{1}{2}$ to $1\frac{1}{4}$, commonly about 1 in. long; mature achenes with somewhat rhomboidal back and very low keel ending in a straight appressed or rarely obsolete tip.

Low ground: Vacaville, *Greene*; Maine Prairie, *Jepson*; southward to the Livermore Pass, *Brewer*. Apr. Fr. May-June.

2. *M. alopecuroides* Greene. ANTIOCH MOUSE TAIL. Leaves 1 line wide, $2\frac{1}{2}$ in. long or less; spike-like receptacles 6 to 10 lines

long, rather thick, sessile, in clusters of about 4 to 9; achenes with prominent spreading beak.

Low plains near Antioch and Stockton; shallow vernal pools in alkaline fields near Vacaville. Mar.-Apr. Fruiting May-June. Between this species and *M. sessilis* Wats. of Oregon there is not the least difference in habit and but a slight difference in the achenes; it is altogether likely that the two plants will be found, in all respects, identical.

8. *RANUNCULUS* L. BUTTERCUP.

Annual or perennial herbs with divided or entire leaves. Flowers solitary or somewhat corymbed, yellow or white. Sepals 5, rarely 4 or 3. Petals 5 (rarely 1 or 3) to many, with a little nectar-bearing pit at base, commonly covered by a scale. Stamens usually numerous. Achenes numerous, in a globular or oblong head. Ovules attached near the base of the cell. (Latin name for a little frog, some species aquatic, growing where frogs are found.)

Petals yellow; nectar-bearing pit covered by a scale.

Leaves undivided; achenes not strongly flattened.

Petals 5; beak of achene straight but short; perennial . . . 1. *R. Flammula*
var. *intermedius*,
Petals 1 to 3, minute; achene beakless or nearly so; annual . . . 2. *R. pusillus*.

Leaves lobed, cleft or divided; achenes flattened.

Perennial; achenes smooth (hispidulous in no. 7).

Leaves with mostly 3 leaflets; petals 5, emarginate; beak subulate, straight . . . 3. *R. Bloomeri*.

Leaves ternately once or twice divided, the divisions parted, lacinate or lobed.

Petals 5 to 8; beak subulate, as long as body of achene. 4. *R. maximus*.

Petals 5; beak very broad, only slightly curved . . . 5. *R. canus*
var. *hesperoxys*.

Petals many (about 9 to 16), in some of the varieties few (5 to 8); beak very short, recurved; herbage more or less pubescent or hirsute; common . . . 6. *R. Californicus*.

Petals 5; beak rather slender, curved or hooked . . . 7. *R. occidentalis*
var. *Rattani*.

Annual.

Achenes with hooked hairs; slender herbs with minute flowers . . . 8. *R. hebecarpus*.

Sides of achenes bearing prickles, the margin with raised border; flowers 4 or 5 lines broad . . . 9. *R. muricatus*.

Petals white; nectar-bearing pit not covered by a scale; aquatic.

Leaves submersed, dissected into capillary divisions; achenes many . . . 10. *R. aquatilis*.

Leaves floating, with broad divisions; submersed leaves as in the preceding or none; achenes 4 to 6 . . . 11. *R. Lobbii*.

1. *R. Flammula* L. var. *intermedius* Hook. SPEARWORT.

Stems slender or almost filiform, decumbent and creeping, rooting at the joints, 4 to 11 in. long; leaves lanceolate or linear-lanceolate, entire, 1 to 2 in. long, tapering into the petiole; flowers 2 to 4 lines broad; achenes few, the short beak straight and stout.

Common at middle altitudes in the Sierras, along the margins of lakes, pools, or shallow slow meadow-streamlets; rare in the Bay Region (Point Reyes, *Davy*). July.

2. *R. pusillus* Poir. Slender annual, 4 to 10 in. high, or succu-

lent and only a few in. high; herbage glabrous or the dilated petiole sometimes sparingly villous-ciliate; leaves long-petioled except the uppermost; radical round-ovate, toothed or entire, 3 to 6 lines long; cauline elliptic-oblong to linear-lanceolate, entire or slightly denticulate, 1 to 2 in. long; flowers minute; sepals subscarious, mostly not reflexed; petals commonly 1 to 3, less than 1 line long; achenes numerous in a small globose head, beakless or nearly so.

Low wet places, rare. Napa Valley, *Bigelow*, 1854; and Sonoma, *Bioletti*, May 1, 1892 (*R. Bioletti Greene*); to San Rafael, *J. P. Moore*, Apr. 14, 1878.

3. **R. Bloomeri** Wats. Glabrous somewhat succulent herb, the stems 5 to 16 in. high, from a cluster of thick-fibrous or even slender-fusiform roots; a few leaves simple, but mostly trifoliate, the radical long (1 ft. or less) -petioled; leaflets roundish, dentate with coarse round teeth, usually petiolulate, sparsely incised or 3-lobed; flowers few and large, $1\frac{1}{4}$ in. in diameter or less; petals 5, emarginate at apex, the greenish area at base conspicuous and the gland large; achenes turgid, $1\frac{1}{2}$ lines long, tipped with a slender subulate beak.

Common in low fields near the coast (not in the inner Coast Ranges): San Mateo Co.; West Berkeley; Marin Co.; Napa Valley; Long Valley, Mendocino Co., *Bolander*. Feb.-Mar. First collected by H. G. Bloomer, pioneer member of the California Academy of Sciences and amateur student of the local botany.

4. **R. orthorhyncus** Hook. var. **maximus**. Diffuse, the stems very stout, $1\frac{1}{2}$ to $3\frac{1}{2}$ ft. long, from a cluster of slender fusiform roots; leaves ternately or biternately divided, the divisions broad, sharply or laciniately cleft; radical leaves biternately compound, at least the primary divisions stalked, on petioles 6 to 22 in. long; petals 5 to 8, oblong-ovate or orbicular, 8 or 9 lines long; achenes with long straight slender style as long as the body.—(*R. maximus Greene*.)

Swampy places: first known from East Berkeley, where it is now extinct; but seldom seen in the typical form; specimens from Marin Co. are referred here.

5. **R. canus** Benth var. **hesperoxys**. Young herbage soft-villous or conspicuously canescent on the under surface of the leaves; stems $1\frac{1}{2}$ to 2 ft. high; leaves nearly all in a radical tuft, long-petioled, deeply parted and subdivided into many lanceolate acute segments; achenes large, flat, 3 lines long, including the short triangular-subulate beak which is slightly curved at the tip.—(*R. hesperoxys Greene*.)

Not common or at least little collected: Antioch, *Davy*, some of the specimens having 8 petals; low hills near Vacaville, *Jepson*; perhaps upper Napa Valley, *Jepson*, but not at all villous, the leaf-segments very broad and merely cleft, the petals uniformly 5 and the achenes typical. Clearly passing into the next. The type is silky-lanate throughout and was collected by Hartweg in the fields of Butte Co. in 1847.

6. **R. Californicus** Benth. COMMON BUTTERCUP. Herbage

deep green and nearly glabrous, or with a short stiffish pubescence, especially on the leaves, or soft-pubescent throughout; stems mostly caespitose, erect or decumbent, 9 to 18 in. long, freely branching and many-flowered; leaves roundish in outline, ternately divided, and again divided, parted or lobed, the earlier with the broad divisions obtusely lobed, the later with the laciniately and sharply cleft divisions less broad or narrowly linear, but in these particulars exceedingly variable on the same individual and on different individuals; sepals usually somewhat petal-like, closely reflexed; petals about 9 to 16, obovate to oblong, 4 to 5 lines long; achenes flattened, $1\frac{1}{2}$ to less than 1 line long, the short and rather stout beak closely recurved.

The most common species, everywhere abundant, coloring leagues upon leagues of grassy hills in the late winter and early spring with its profusion of yellow flowers. Running into innumerable varieties, few of which are in anywise distinguishable. The following may be noted: Var. *LAETUS* Greene. Erect, stoutish, the herbage light yellowish-green; segments of the large leaves rather broad.—Low lands, vicinity of the salt marsh region, Suisun, etc. Feb. Var. *GRATUS*. Taller and more slender than the type; petals 5, or (on the same individual) 7 or 8; style not slender, rather strongly curved; achenes mostly glabrous.—Commonly in wooded country: hills of Napa Valley; Vaca Mountains. Mar.—Apr. This form can be traced into the typical *R. occidentalis* of the north which occurs as far south as Ukiah (*Purdy*).

7. *R. occidentalis* Nutt. var. *Rattani* Gray. Very similar to *R. Californicus*, but the leaf-segments commonly broad; petals 5; style subulate, forming a curved beak, this longer relatively to the achene which is papillose-roughened and densely hispidulous.

First collected by Rattan on the Klamath; credited by Greene to Mt. Hamilton; otherwise little known in the Coast Ranges.

8. *R. hebecarpus* H. & A. Very slender herb, 5 to 11 in. high. branched above, sparsely villous; leaves thin, rounded or reniform in outline, 3-parted into ovate entire or notched or lobed divisions, or the upper divided into 3 divergent narrowly oblong acute segments; peduncles 3 to 6 lines long; flowers minute, yellow; petals of about the same length as the stamens; achenes few, hispidulous with hooked hairs, orbicular, flat, 1 line long, tipped with a short curved beak.

Common in the shade of Oaks and other trees in the hill country from San Luis Obispo northward: Loma Prieta; Berkeley; Mt. Diablo; Vacaville; also in the Sierra Nevada.

9. *R. muricatus* L. Rather stout and succulent; 3 to 10 in. high; herbage yellowish-green, glabrous; leaves roundish or reniform, deeply 3-cleft, the segments again cleft or toothed; petals 3 to 4 lines long; achenes 4 lines long, including the stout ensiform beak, the sides very flat, surrounded by a raised border and coarsely muricate or prickly.

Naturalized, the known localities few: San Francisco; Marin Co.; Knight's Ferry, Sierra Foothills. Apr.

10. **R. aquatilis** L. WATER BUTTERCUP. Perennial; leaves submersed, all many times dissected into filiform or capillary divisions; flowers $\frac{1}{2}$ in. in diameter or less; sepals deciduous; styles subulate, rarely persisting; achenes transversely rugose, commonly hispidulous, about 11 to 18 in a rather compact round head.

Common in ditches and ponds, less frequently in running water; in the Coast Ranges and Sierras. Pilarcitos Lake, San Mateo Co.; Berkeley; Sonoma; Upper Napa Valley. In the last locality floating leaves are found, 7 to 10 lines broad, all of the oval or orbicular segments 2, 3, or 4-notched.

11. **R. Lobbii** Gray. LOBB'S BUTTERCUP. Annual; submersed leaves none, or when present, few and as in the preceding; floating leaves 6 lines broad, divergently 3-parted into oblong or ovate lobes, the middle one commonly entire, the lateral notched; stamens 5 to 10; petals withering persistent; styles filiform, about 3 times the length of the ovary; achenes few (4 to 6), rather sharply rugose, the mature ones sometimes with minute black dots.

Whitening the surface of shallow vernal ponds, Marin Co. to Upper Napa Valley. Apr.-May.

9. **THALICTRUM** L. MEADOW RUE.

Perennial herbs with tall erect stems from a short rootstock bearing bi- or tri-ternately compound leaves with petiolulate (or some sessile) leaflets. Flowers many, small, paniced, in ours diceious. Sepals in pistillate flowers 4 to 7, in staminate flowers more commonly 4, greenish or more or less petal-like. Petals none. Stamens numerous with long mucronate anthers on capillary filaments. Achenes 4 to 15, veined or furrowed and usually acute at both ends, sometimes inflated, tipped with the persistent long styles. (From the Greek thallo, bloom, the application uncertain.)

1. **T. polycarpum** Wats. Glabrous, aromatic, $1\frac{3}{4}$ to 3 ft. high; leaflets ovate to roundish, $\frac{1}{2}$ to 1 in. long, the pair below the terminal one usually sessile, serrate or incised or divided into 2 or 3 segments, the teeth acute or acutish, rather prominently veined beneath; panicle 3 to 6 in. long, terminal or with accessory branches from the upper axils; sepals elliptic to ovate, mostly acute; stamens 16 to 25, anthers yellowish; pistils of about the same number, styles purplish; achenes somewhat inflated, the sides marked with anastomosing veins.

Coast Ranges: Conn Valley, Napa River Basin; Marin Co. Last of Mar.-May. In the Contra Costa Hills passing into the var. **HESPERIUM** (*T. hesperium* Greene); leaflets with more obtuse lobes, less veiny beneath, often glandular, puberulent, as also the inflorescence. —Berkeley and Oakland Hills. Apr.-May.

10. **ACTÆA** L. BANEERRY.

Perennial herbs with bi- or tri-ternately compound ample leaves. Flowers small, white, in a short terminal raceme. Sepals about 4, roundish or obovate, concave, caducous. Petals small, plane, entire,

rhombic-spatulate, or none. Stamens many, with small anthers and slender white filaments, more showy than the petals. Pistil 1, the broad stigma sessile, obscurely 2-lobed. Fruit a berry. (Latin name of the Elder, transferred by Linnaeus to these plants.)

1. *A. spicata* L. var. *arguta* Torr. Plants with stoutish root-stocks, propagating vegetatively by suckers; stems clustered, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; leaves mostly radical, 1 to 2 ft. long, triterately divided, then trifoliolate, or the middle divisions again ternate; leaflets rather deeply incised and sharply serrate, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long; petioles short or almost none; racemes terminal, 1 in. long, or with 1 or 2 small lateral racemes in the axils of the upper leaves; tips of sepals often pinkish; petals none, or 1 or 2 and white, concave dorsally; stamens 11 to 14 or 18; berries red or white with polished surface.

Northward slopes of bushy hills, rather infrequent: Berkeley; Marin Co. Mar.-Apr.

35. BERBERIDACEÆ. BARBERRY FAMILY.

Shrubs or herbs. Ours have alternate exstipulate compound leaves; flowers perfect, regular, hypogynous, with 6 sepals and 6 petals (there being 2 circles of each, 3 pieces in a circle); stamens as many as the petals and opposite them; anthers opening by an uplifting valve or lid. Ovary one, 1-celled, becoming in fruit a berry or capsule. Seeds with endosperm.

Prickly shrubs; leaves pinnate; petals bifid 1. BERBERIS.

Perennial herbs; leaves bi- or tri-ternate; petals entire 2. VANCOUVERIA.

1. BERBERIS L. BARBERRY.

Shrubs with yellow wood. Leaves alternate, prickly, in ours pinnately compound with the rachis jointed at the insertion of the leaflets. Flowers yellow, in bracteolate racemes. Sepals petal-like. Petals concave, in ours distinctly bifid. Filaments irritable. Stigma peltate-umbilicate. Fruit a berry. (Berberys, Arabic name of the fruit.)

Racemes from small lateral or terminal buds of triangular or roundish deciduous scales, about 2 lines long.

Leaflets 5 to 7, very undulate and strongly spinose, few-toothed . . . 1. *B. dictyota*.

Leaflets 5 to 17, nearly plane, with many prickly teeth 2. *B. pinnata*.

Racemes from a large terminal bud of persistent glumaceous scales about 1 in. long 3. *B. nervosa*.

1. *B. dictyota* Jepson. Erect, stout, scarcely branched, 3 to $4\frac{1}{2}$ ft. high, sparsely leafy; leaflets 5 to 7, glaucescent on the upper surface, little paler but very prominently reticulated on the under surface, very strongly undulate, lowest pair close to base of petiole; filaments with a recurved tooth on each side near the apex.

Denuded areas in the Pellejo Hills, Solano Co., growing in the crevices of rocks, the only known locality within our limits. First collected at the Marysville Buttes. Mar. Leaflets strongly callous-margined, glaucescent on the upper face, little paler beneath, so

strongly undulate that the few but stout spines are presented in nearly every direction. Racemes fewer and not so dense as in *B. pinnata*; pedicels 5 to 6 lines long. Wood not so yellow as in no. 2.

2. *B. pinnata* Lag. CALIFORNIA BARBERRY. A few in. to 4 or 5 ft. high; leaflets usually 5 to 9 but often 11 to 13 (or even as many as 17 and rather crowded on the rachis), ovate-elliptical to oblong, 1 to 2½ in. long, shining above, somewhat paler beneath, plane or moderately undulate, shallowly repand and dentate, the mostly numerous teeth prickly; lowest pair close to base of petiole; racemes clustered, dense; filaments as in the last.

Rather common on hills, mostly along the edge of thickets. Berkeley Hills and San Francisco southward to Monterey. Mar.-Apr.

3. *B. nervosa* Pursh. MAHONIA. Leaves in a tuft from a low scaly caudex, 9 to 16 in. long, the rachis conspicuously nodose; leaflets 11 to 17, bright green, ovate to ovate-lanceolate, spinulose-serrate, and somewhat palmately nerved; scales of the strong terminal bud about 1 in. long, coriaceous-glumaceous; racemes erect, elongated, 4 to 6 in. long; bracts oblong to lanceolate, membranaceous; filaments not toothed.

Woods near the coast from Marin Co. northward to Oregon and Washington.

2. *VANCOUVERIA* Morr. & Decsne.

Low perennial herbs with slender creeping rootstocks and bi- or tri-ternately compound leaves, all radical or nearly so. Flowers small, nodding, arranged in a panicle on slender scape-like peduncles. Sepals 6 in two series, obovate, petal-like, reflexed, subtended by 6 to 9 small calycine bractlets. Petals 6, deflexed. Stamens 6, erect, often closely appressed to the pistil, the anther connective produced into a pointed tip. Pistil 1, stigma scarious-cupulate. Fruit a follicle, dehiscent by the dorsal suture. Seeds arillate. (Capt. George Vancouver of the English exploring ship *Discovery*, who visited San Francisco Bay in 1792.)

1. *V. chrysantha* Greene var. *parviflora*. INSIDE-OUT FLOWER. Stems from a branched rootstock, clustered, sparsely pubescent with short spreading gland-tipped hairs, or at base rusty-pilose, 8 to 20 in. high; foliage glabrous, or rusty-pilose on the petiole at the forks; leaflets green above, paler or whitened beneath, roundish in outline, broadly cordate at base, obscurely or evidently 3-lobed, narrowly cartilaginous-margined and often crenulate or crisped, ¾ to 1½ in. long; frequently broader than long, petiolulate; panicle loose, 2½ to 7 in. long, bearing 25 to 30 small white or lavender-tinged flowers; petals 2 lines long; ovules 2 or 3.—(*V. parviflora* Greene.)

Coast Ranges, in the shade of forests from the Santa Cruz Mountains northward; Oakland Hills, acc. to Greene; Marin Co., *Chesnut & Drew*; near Calistoga, *Jepson*. May. Leaves said to persist through the winter, but flowering specimens from Calistoga exhibit leaves that are nearly half perished. In some country districts called "Flowering Fern."

36. PAPAVERACEÆ. POPPY FAMILY.

Herbaceous plants (*Dendromecon* is a shrub) with mostly colored juice and regular perfect flowers. Sepals 2 or 3, the petals twice as many. In *Eschscholtzia* the 2 sepals are united into a single piece like a fool's cap. Stamens numerous, rarely few. Carpels 2 to several, united into a 1-celled superior ovary (in *Platystemon* the lightly united carpels become distinct in fruit).

Sepals 3, petals 6; annuals; leaves opposite or radical.

Filaments petal-like; carpels 6 to 20, in anthesis united into a compound ovary, in fruit separating and through constrictions breaking up into 1-seeded joints 1. *PLATYSTEMON*.

Filaments filiform or flattened; carpels 3, united into a 3-angled or terete ovary, forming in fruit a 3-valved capsule 2. *PLATYSTIGMA*.

Sepals 2 (in *Eschscholtzia* the calyx is a single mitre-like piece which is pushed off by the expanding petals); petals 4; leaves alternate.

Leaves entire, coriaceous; capsule 2-valved; shrubby 3. *DENDROMECON*.
Leaves not entire.

Receptacle hollowed or cup-like; flowers erect in bud; capsule 2-valved; leaves ternately dissected; annual or perennial herbs 4. *ESCHSCHOLTZIA*.

Receptacle not excavated; flowers nodding in the bud; capsule opening by holes just below the summit; leaves pinnately cleft, lobed or divided; ours annuals 5. *PAPAYER*.

1. *PLATYSTEMON* Benth.

Low annual with mainly opposite entire leaves. Sepals 3. Petals 6 in two series. Stamens numerous; filaments petal-like and obovate or spatulate. Stigmas subulate-filiform, one terminating each carpel; carpels 6 to 17 or 20, each several-ovuled, connivent or coherent in a circle, becoming torulose, at maturity separating, and breaking transversely into indehiscent 1-seeded joints. Anthesis lasting for more than one day. Petals tardily deciduous, withering and closing over the forming fruit. (Greek *platus*, broad, and *stemon*, a stamen.)

1. *P. Californicus* Benth. CREAM-CUPS. Conspicuously pilose; branched from the base, widely spreading and more or less decumbent or nearly acaulescent, 3 to 6 in. high; peduncles more or less scape-like, 5 in. long; petals cream-yellow; stamens about 25.

Common almost throughout California, in the hills and on the plains, in Apr. Free ovules are sometimes found opposite the constrictions in the carpels, having been forced through the thin suture as the carpels become torulose. In plants from Ukiah the petals are deeper colored at apex with this color repeated as a spot on the lower portion of the petals.

2. *PLATYSTIGMA* Benth.

Annual herbs with the leaves, sepals and petals as in *Platystemon*, the flowers rarely with 2 sepals and 4 petals. Petals deciduous. Stamens 6 to 12. Carpels 3, combined into a single 1-celled ovary, which is 3-lobed or nearly terete. Placentæ as many as the carpels, parietal, many-ovuled. Stigmas ovate to subulate. Capsule completely 3-valved, dehiscent through the placentæ. (Greek *platus*, broad, and *stigma*, a stigma.)

Not acaulescent; peduncles glabrous; flowers light yellow; ovary linear; capsule
 tw. sted 1. *P. Californicum*.
 Acaulescent or nearly so; scapes hairy; flowers light yellow; ovary and capsule
 3-lobed 2. *P. lineare*.

1. *P. Californicum* (Torr.) B. & H. Very slender, erect, 4 to 7 in. high, paniculately or dichotomously branched above or even from the base; glabrous throughout; radical and lower leaves elliptic to obovate-spatulate, 5 to 11 lines long, often contracted into a petiole, the upper cauline oblanceolate to linear; peduncles 2 to 3 in. long, erect in anthesis, in fruit deflexed almost horizontally but the capsule vertical or nearly so; sepals often reddish; petals white, elliptic to oblong, often narrowed to a short claw, 3 to 5 lines long; stamens 6 to 12, rarely 4, unequal, in two series, the outer shorter; filaments filiform, slightly dilated upwards; capsule $\frac{1}{2}$ to 1 (rarely $1\frac{1}{2}$) in. long.—(*Platystemon Torreyi* Greene.)

San Francisco Peninsula and southward. Mar.—Apr.

2. *P. lineare* Benth. Acaulescent or nearly so; scapes commonly 4 to 8 in. high, hispid with spreading hairs; leaves linear, 1 to 2 in. long, sessile; sepals brownish; petals light yellow cuneate-orbicular or obovate, 4 to 9 lines long; stamens numerous, filaments conspicuously dilated; body of capsule 5 to 7 lines long.

Clear Lake to Oakland, *Holder*; San Francisco, *Bloomer*, and southward. Mar.—May. Leaves often with several parallel nerves beneath.

3. DENDROMECON Benth.

Low branching shrub with alternate entire and coriaceous leaves and yellow flowers. Sepals 2. Petals 4. Stamens numerous, with short filiform filaments and linear anthers. Ovary linear with 2 nerve-like placenta. Capsule linear. Seeds pitted, provided with a caruncle. (Greek dendron, tree, and mecon, poppy.)

1. *D. rigidum* Benth. TREE POPPY. Glabrous, 2 to 4 or even 7 ft. high; main stems one or several, somewhat trunk-like, often 1 in. thick and with very shreddy bark; branches white or light colored; leaves reticulate-veiny, oblong or acute at each end, yellowish green above, hispidulous on the margin, mucronate-acuminate, 3 in. long, borne on very short petioles which, by a twist, bring the blade vertical; upper leaves smaller and oblong-ovate or lanceolate; flowers golden yellow, 1 to $2\frac{1}{2}$ in. in diameter, on pedicels 1 to 3 in. long; sepals orbicular; capsules curved, 2 to 4 in. long, attenuate into a short style bearing 2 oblong stigmas.

Dry slopes and ridges of the Coast Ranges at middle altitudes from Lake Co. and Caux's Knob (east of St. Helena) to Mt. Tamalpais and Mt. Diablo; thence southward to San Diego; also in the Sierras. Last of Apr.—June.

4. ESCHSCHOLTZIA Cham.

Annuals or perennials with watery juice, petioled ternately dissected leaves and peduncled yellow flowers. Receptacle hollowed or

excavated, surrounding the base of the pistil, the calyx and corolla in consequence seeming as if perigynous; this receptacle in addition often bears a spreading outer and an erect inner rim. Sepals completely united into a calyptra or extinguisher-shaped body which parts from the receptacle and is pushed off by the expanding petals. Stamens numerous, mostly on the base of the petals; anthers commonly longer than the filaments. Ovary linear; style very short; stigmas commonly 4, subulate-filiform unequal. Capsule 1-celled, many-seeded, 2-valved; dehiscence commonly occurs after the capsule parts from the receptacle and before it reaches the ground, usually beginning at the moment that the base of the capsule is released from the vise-like hollowed receptacle, this action allowing the valves which are elastically dehiscent from base to apex, to separate. (Collected at San Francisco in 1816 by Adelbert von Chamisso, German poet and naturalist, and named by him in honor of his college friend and companion on a scientific voyage around the world, Dr. J. F. Eschscholtz.)

Receptacle with broad rim, cotyledons 2-cleft; perennial (or some varieties annual) 1. *E. Californica*.

Receptacle destitute of rim or the rim represented by a mere herbaceous ring; cotyledons entire; annuals.

Stems leafy; petals fan-shaped, longer than broad 2. *E. caespitosa*.

Acaulescent; petals rhomboidal, mostly broader than long. 3. *E. rhombipetala*.

1. **E. Californica** Cham. CALIFORNIA POPPY. Suberect or diffuse, with stems 1 to 2 ft. long; radical leaves ternately several times dissected into linear or oblong segments, on long petioles, the whole leaf $\frac{1}{3}$ to 1 ft. long; cauline smaller on shorter petioles; peduncles 2 or 3 to 6 in. long; petals fan-shaped, $\frac{1}{2}$ to 2 in. long, varying from deep orange to straw-color; outer spreading rim of the receptacle $\frac{1}{2}$ to 2 lines wide; inner erect rim hyaline; capsule 1 to 3 or even 4 in. long.

One of the most common, striking and widely diffused plants of the Californian flora, abundant in the spring but in many portions of the state found in flower in other or in all seasons. On account of its gorgeous beauty it has been favored with an exceptional number of poetic names mostly derived from Spanish sources, such as "Copa de Oro," "Torosa," "Amapola," "Dormidera." The original specimens, from which the species was first described, came from the San Francisco sand hills; this form has small flowers and a very narrow rim to the receptacle and is common everywhere in the immediate vicinity of the ocean. The interior form, which is much more robust and may be designated as var. *CROCEA* (*E. crocea* Benth.), has a very conspicuous rim to the receptacle (often 2 lines wide), and very large flowers, the petals as much as 2 in. long. It is abundant everywhere in the valleys, on the plains and among the foothills, frequently covering large areas in Apr. and May with an extraordinary profusion of golden or deep orange flowers. In the sunshine the sheen of the petals is exceeding striking and brilliant. In the latter part of May and in June the tips of the petals become yellow and by autumn the

species produces wholly straw-colored and comparatively small flowers. This dry season form simulates very closely the form of the sand hills which is exposed to adverse conditions near the sea. Although the various large-flowered forms have been described as distinct from the original seacoast form, there are in reality not the slightest constant distinctions to be had; there are not only gradations between the forms but the gradations are so numerous and moreover, topographically considered, cover such extensive areas of country that they are almost or quite as likely to be found as the extremes. The maintenance of such forms as artificial species on the grounds of convenience would in this case have no point whatsoever. Even in San Francisco Co. large-flowered forms with a broad rim to the receptacle are common. In addition the following varieties may be noted:

Var. *AMBIGUA* (E. *ambigua* Greene). Annual, glaucous, scabrous-pubescent throughout.—Mt. Diablo, acc. to Greene, otherwise not known within our limits. Var. *DOUGLASII* (E. *Douglasii* H. & A.) has the outer rim of the torus narrower than or not exceeding the erect inner one and the petals yellow shading into orange at base.—Plains of Solano and Contra Costa Co., acc. to Greene. Var. *COMPACTA* (E. *compacta* Walp.) is acaulescent.—From the Bay Region, where it is perennial, to Fresno, where it is seemingly annual.

2. *E. cæspitosa* Benth. Annual plants $\frac{3}{4}$ to 2 ft. high; stems few or many, slender or rather stout, leafy and leafy tufted at base or the subradical leaves few; leaves mostly twice ternately dissected; peduncles 3 to even 8 in. long, much exceeding the leaves; calyx oblong-conical, abruptly slender pointed; receptacle short-tubular, 1 to 2 lines deep; petals $\frac{3}{4}$ to 1 in. long; capsule $1\frac{1}{2}$ to 3 in. long; seeds reticulate; embryo $\frac{1}{3}$ of a line long, the cotyledons (as seen in the seed) divergent.

Cañon sides of the higher Coast Ranges: Vaca Mountains; Mayacamas Range east of Napa City, and southward. Apr.—May.

3. *E. rhombipetala* Greene. Acaulescent, densely tufted; scapes very many, stout, diffuse, 3 to 4 in. high, twice as long or equaled or exceeded by the thick tuft of nearly equal subradical leaves; these laciniately cleft into 3 to 6 linear divisions, glaucous or glaucescent; receptacle subcylindrical; spreading rim obsolete, likewise the scarios inner margin or this very narrow and approximate to the trace of the obsolete rim; petals rhombic-ovate or orbicular, 5 lines long, 6 lines broad, fugacious; capsule 3 in. long or less, very large for the size of the plant; seeds reticulate; embryo about $\frac{1}{2}$ line long; cotyledons very short, the embryo with scarcely more than a notch at the apex.

Plains and rolling country near the Coast Range foothills: Brown's Valley, Solano Co., *Jepson*; to Antioch, *Brandegee*. Mar.—Apr. Scapes sparsely tuberculate-scabrous.

5. PAPAVER L. POPPY.

Ours annual herbs with narcotic juice. Leaves pinnately cleft, lobed, or divided. Flowers showy, solitary on long peduncles, nodding in bud. Sepals 2. Petals 4. Stamens very many. Ovary and

capsule obovoid to subglobose, with 4 to many intruded placenta. Capsule dehiscent just below the stigmatic summit by pores or valve-like openings.

Juice milky; stigmas sessile and radiate upon the summit of the ovary

1. *P. Californicum*.

Juice yellow; stigmas capitate upon the short slender style . 2. *P. heterophyllum*.

1. **P. Californicum** Gray. WESTERN POPPY. Two ft. high or less; glabrous or sparsely pilose-pubescent; juice milky; leaves pinnately divided, the segments oblong or roundish, toothed or lobed or entire; petals red with a green spot at base; stigmas sessile and radiate upon the summit of the ovary, persistent in fruit; capsule $\frac{1}{2}$ in. long or more, turbinate-obovate, 6 to 11-nerved; pores or valve-like openings just beneath the stigmas, quadrate.

Mt. Tamalpais, *M. A. Howe*; otherwise of the southern part of the State from the Santa Inez Mountains to Los Angeles. May.

2. **P. heterophyllum** (Benth.) Greene. WIND POPPY. One and one-fourth to 2 ft. high, glabrous; juice yellow; leaves pinnate or pinnately cleft, or pinnate with pinnately cleft lobes, the segments exceedingly diverse in shape on the same plant or even on the same leaf, varying from oval and entire or lobed to narrowly linear; petals broadly cuneate-obovate, brick-red, with a dark spot at base, 1 in. long or less; stigmas capitate at summit of a distinct and slender style; capsule clavate-obovoid, 3 to 7 lines long; pores small with rounded valves which separate from the stout parietal ribs.—(*Meconopsis heterophylla* Benth.)

Middle California: Berkeley; Livermore; Stockton; San Mateo; southward to Southern California. Thought to be rare north of San Francisco Bay. May.

Var. **crassifolium** (*Meconopsis crassifolia* Benth.). BLOOD DROPS. Plant smaller, more branching and with more numerous flowers; leaves smaller and thicker; flowers small, erect.—Interior fields; with the preceding at Sunol Glen, acc. to Geo. B. Grant, May, 1900.

37. FUMARIACEÆ. FUMITORY FAMILY.

Glabrous herbs with alternate compound dissected leaves and irregular perfect flowers borne in racemes. Sepals 2, small and scale-like. Petals 4, in 2 dissimilar pairs, the outer larger, inner pair narrower, carinate or erected on the back, cohering by the callous apex and covering the anthers and stigma. Stamens in 2 sets of 3 each, placed opposite the outer petals, the filaments of each set usually united; middle anther of each set 2-celled, the lateral ones 1-celled. Ovary superior. Capsule 1-celled, with 2 parietal placenta from which the valves separate, or indehiscent.

1. **DICENTRA** Bernh. DUTCHMAN'S BREECHES.

Perennial herbs with the stems and leaves from a tuber-like, grain-bearing or scaly crown. Flowers racemose or paniculate. Corolla flattened and cordate at base. Filaments of each set dilated and

united, but distinct at the very base and slightly free above. (Greek *dis*, twice, and *kentron*, a spur, some species 2-spurred.)

Stems leafy; flowers yellow, petals distinct. 1. *D. chrysantha*.
Acaulescent; scape naked; flowers rose-purple, petals united. 2. *D. formosa*.

1. *D. chrysantha* H. & A. Glaucous plants with stiff coarse leafy stems 2 to 3 ft. high; leaves bipinnate, $\frac{1}{2}$ to 1 ft. long or more, the divisions cleft into narrow lobes; flowers yellow, in a large racemose panicle; corolla linear-oblong, only slightly cordate, $\frac{1}{2}$ in. long; petals distinct; capsule $\frac{3}{4}$ to 1 in. long; style slender, persistent, at dehiscence of the capsule splitting up to the stigma; seeds crestless.

High dry ridges of the inner Coast Ranges, but not common: Lake Co.; Vaca Mountains; Mt. Diablo; Crystal Springs, San Mateo Co., *Vasey*, 1875; and southward. Sometimes called "Golden Ear-drops."

2. *D. formosa* DC. BLEEDING HEART. Acaulescent; root-stock fleshy and spreading; leaves on very long petioles, biternately compound, the divisions incisely cleft or pinnatifid; scapes slightly exceeding the leaves, 2 ft. high, naked, terminated by a cluster of short racemes with subulate bracts; corolla rose-purple, ovate-cordate; petals all united to above the middle, the larger with short spreading tips; stigma with a double pair of lobes; seeds crested.

Shady woods: Moraga Cañon near Oakland, *Chas. Palache*; common in Marin Co. and northward; also in the Sierras. Apr.-June.

38. CRUCIFERÆ. MUSTARD FAMILY.

Herbs with alternate leaves, no stipules and the flowers in terminal bractless racemes (or in *Tropidocarpum* with a leafy raceme). Sepals and petals each 4, regular and distinct. Petals rarely none, commonly with claws, the blades spreading in the form of a cross. Stamens 6, commonly tetradynamous (4 long and 2 short), sometimes subequal, sometimes 4 or 2. Ovary superior, 2-celled by a thin partition stretched between the placenta. Fruit a capsule the 2 valves separating from below upwards, leaving behind the placenta and partition, or sometimes indehiscent, or breaking up transversely into 1-seeded joints. Capsule long and narrow (a silique) or short and roundish (a silicle) commonly termed a "pod" and either terete, 4-sided, compressed (flattened parallel to the partition) or obcompressed (flattened contrary to the partition). Seeds in each cell attached alternately to either placenta and occupying the center of the cell (in 1 row) or disposed in 2 rows (the seeds from either placenta not overlapping each other). Embryo always curved, the caulicle folded upon the back of one of the cotyledons (incumbent) or along the edge of the cotyledons (accumbent). Herbage always with the characteristic mustard-like or pungent juice. *Streptanthus glandulosus* has a somewhat irregular flower.

A. Pod completely dehiscent by two valves.

- 1. Pod a silique, several times (or at least three times) longer than broad.**
 Seeds in 1 row in each cell (except *Sisymbrium multifidum* and *Arabis glabra*);
 silique linear or narrowly linear.
 Racemes leafless.
 Filaments with one or two pairs connate (except 1 or 2 species); silique
 compressed; sepals colored, commonly purple; petals purple varying
 to whitish, the limb narrow, commonly undulate-crisped 2. STREPTANTHUS.
- Filaments all distinct.
 Silique terete, pointed with a long conical beak prolonged much beyond
 the valves; flowers large, yellow 5. BRASSICA.
 Silique terete, 4-sided or compressed, tipped with a short style or
 pointless.
 Silique narrowly linear, elongated, terete or nearly so.
 Leaves coarsely toothed or some pinnatifid or entire; flowers
 white or yellowish 1. THELYPODIUM.
 Leaves for the most part pinnatifid, or the lowest pinnately
 parted; flowers yellow 3. SISYMBRIUM.
 Silique compressed; valves more or less 1-nerved; flowers purple,
 white or nearly white 8. ARABIS.
 Silique pointed, somewhat triangular, midrib of valve conspicuous;
 flowers rather small, bright yellow 9. BARBAREA.
 Silique 4-sided or flattened; valves 1-nerved; flowers large, pale
 yellow or orange 7. ERYSIMUM.
 Silique compressed, pointed.
 Stems sparingly leafy from a perennial, tuberous rootstock;
 flowers large, white to rose-tinted 11. DENTARIA.
 Stems leafy; annual with fibrous roots and smaller flowers . . .
 12. CARDAMINE.
 Racemes leafy; silique obcompressed 13. TROPIDOCARPUM.
 Seeds in 2 rows in each cell; silique terete, linear to oblong; flowers small
 (2 lines long or less), white or yellow 10. NASTURTIUM.
- 2. Pod a silicle, roundish or little longer than broad.**
 Silicle turgid, obovoid or pear-shaped; edges of the valves narrowly
 margined; flowers yellowish 15. CAMELINA.
 Silicle much flattened contrary to the narrow partition and
 obcordate or elliptical, several-seeded; flowers white or slightly
 yellowish 14. CAPSELLA.
 Didymous, the valves separating as closed 1-seeded nutlets; flowers
 greenish-white 20. CORONOPUS.
 Orbicular or ovate, more or less emarginately winged at summit; flowers
 white or apetalous 19. LEPIDIUM.
 Silicle flattened parallel to the broad partition; flowers white
 18. ALYSSUM.
- B. Pod indehiscent.**
 Pod elongated, breaking transversely into 1-seeded indehiscent joints.
 Pod several-seeded, commonly with constrictions between the seeds;
 flowers showy 6. RAPHANUS.
 Pod 2-jointed, breaking in the middle, each joint 1-seeded; flowers small.
 4. CAKILE.
 Pod broader than long, more or less didymous, the cells indehiscent but sep-
 arating from the axis when ripe 20. CORONOPUS.
 Pod wholly indehiscent, roundish or obovate.
 Pod 1 to several-seeded, wingless 16. ATHYSANUS.
 Pod 1-seeded, margined with a wing 17. THYSANOCARPUS.

1. THELYPODIUM Endl.

Ours annual herbs. Flowers white or pale yellow (straw-colored), in often dense racemes. Leaves mostly petioled, not auriculate or clasping. Petals with narrow claw and linear or obovate exerted limb. Stamens tetradynamous, exerted, with long and slender, never united filaments. Anthers narrowly linear, sagittate, curved. Stigma circular or obscurely 2-lobed, usually small. Pod elongated,

terete, sessile or short-stipitate. Seeds oblong, somewhat flattened, not winged. Cotyledons incumbent. (Greek, *thelus*, female, and *pus*, foot or support, the ovary more or less stipitate.)

Cauline leaves mostly petioled; flowers $1\frac{1}{2}$ to 2 lines long . . . 1. *T. lasiophyllum*.
Cauline leaves sessile or the lower frequently petioled; flowers 4 or 5 lines long.

Ovary glabrous; petals conspicuously exceeding the acuminate sepals

2. *T. Greenei*.

Ovary hairy; petals little exceeding the obtuse sepals . . . 3. *T. flavescens*.

1. *T. lasiophyllum* Greene. Annual; erect, simple or branching above, 1 to 3 ft. high, hispid with scattered hairs or nearly glabrous above; lower leaves sinuately pinnatifid with mostly acute denticulate or entire segments, 2 to 5 in. long, the upper lanceolate, less lobed or merely toothed, all petioled, or the upper rarely sessile; flowers $1\frac{1}{2}$ or 2 lines long, closely clustered, white or yellowish, on commonly curved pedicels 1 line long; sepals oblong, scarcely more than half the length of the narrow petals; pods ascending or strictly deflexed, straight or somewhat curved, 2 to 4 in. long, $\frac{1}{2}$ line wide or less, obtuse at apex.

More frequent in the Coast Range region but also in the Sierras. Apr. A variable species. Var. *RIGIDUM* Robinson. Often branching from the base; pods $1\frac{1}{2}$ in. long, $\frac{3}{4}$ line broad, divaricately spreading, sharply tipped with the short style, more or less torulose.—Elmira to Antioch. Var. *INALIENUM* Robinson. Pods $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, 1 line broad, erect or slightly spreading.—Collinsville, *Brandeggee*. Scarcely differing from the preceding variety.

2. *T. Greenei*. Glaucous and glabrous; erect, 3 to 4 ft. high, the stem with several much elongated simple branches from below the middle; leaves all sessile except the radical; lower cauline leaves ovate or oblong-lanceolate, irregularly or somewhat erosely toothed or lacinate, sometimes with two or three pairs of broad salient lobes below the middle, 8 in. long or less; petiole about 1 in. long; uppermost leaves linear-lanceolate, sharply serrate or denticulate, 1 to 4 in. long, sessile; racemes in flower rather dense, in fruit much elongated (even $2\frac{1}{2}$ ft. long); flowers 4 to 5 lines long, pale yellow; sepals narrowly oblong, tapering to an acuminate apex, which often bears a few hairs; petals much exceeding the sepals, the claw broad and the undulate blade narrow; ovary glabrous; pods 2 to 3 in. long, rather less than 1 line wide, beaked by the style.—(*T. flavescens* Greene, not *Streptanthus flavescens* Hook.)

Brandeggee's Collinsville specimens are illustrative of the natural type here described which is not infrequent from Main Prairie to the Montezuma Hills and Antioch; thence southward through the Mt. Diablo range. It is our present opinion that *T. procerum* (also referred to *Streptanthus* and *Caulanthus*) of authors is the same; if it be distinct the contrasting characters have yet to be discovered. A satisfactory arrangement in this group can only be had, however, when complete material (now lacking to herbaria) has been gathered by field-students.

3. *T. flavescens* (Hook). One ft. high, perhaps more; stems,

petioles, midribs and margins of leaves hispidulous; leaves coarsely and unequally toothed, the lower petioled and sometimes pinnatifid, the uppermost sharply denticulate or entire; flowers yellowish, 4 lines long; sepals oblong, broadest toward the acute apex; which usually bears a few hairs; petals undulate, the claw as broad or broader than the blade, little exceeding the sepals; ovary hairy; fruit unknown to us.—(T. Hookeri Greene.)

Mt. Diablo region (Livermore, *Greene*, Mar. 10, 1889) to Monterey, *Douglas*, about 1830. Description drawn from *Greene's* specimens which match fairly well the illustration of *Douglas's* specimen in *Hooker's Icones*, figured under the name of *Streptanthus flavescens* Hook. Very doubtfully distinct from the preceding.

2. STREPTANTHUS Nutt.

Annuals or a few biennials, often glaucous. Radical leaves commonly toothed or pinnatifid, the cauline similar or entire, often sagittate-clasping. Sepals of the same color as the petals, two or all saccate at base, the calyx thus ovoid or broad at base and contracted above or by the spreading of the tips becoming somewhat flask-shaped, rarely subcylindric. Petals purple or white, with a narrow undulate or crisped limb and channeled claw, regular or somewhat irregular as in no. 6. Stamens tetradynamous, or in 3 unequal pairs, the 2 longer pairs with filaments connate below or the uppermost pair with entirely united filaments. Siliques oblong to narrowly linear, flattened parallel to the partition, sometimes subterete; valves 1-nerved or rarely carinate. Seeds flat, margined or winged. Cotyledons accumbent. Receptacle enlarged. (Greek streptas, twisted, and anthos, flower, in reference to the petals.)

Upper leaves oval or orbicular and cordate-clasping.

Filaments all distinct or one pair connate; biennial, the flowering stems from an indurated stock 1. *S. suffrutescens*.

Filaments distinct; annual 2. *S. orbiculatus*.

Upper leaves mostly narrow; filaments of longer stamens connate in pairs; annuals.

Herbage glabrous; 2 pair of filaments connate.

Some lower leaves broadly ovate; flowers very short-pedicelled; petals purple and white 3. *S. Breweri*.

Cauline leaves all linear; petals white.

Flowers subsessile; sepals with whitish tips 4. *S. barbiger*.

Flowers long-pedicelled; sepals dark purple or black 5. *S. niger*.

Herbage hispid-pubescent or hirsute; upper pair of filaments connate.

Leaves mostly narrow.

Flowers purple; raceme not 1-sided 6. *S. glandulosus*.

Flowers pale; raceme 1-sided 7. *S. secundus*.

Some leaves obovate; petals purplish with white tips 8. *S. hispidus*.

1. *S. suffrutescens* Greene. Biennial (sometimes annual?), herbage glabrous; branches 6 to 15 in. long from a stout indurated trunk 6 to 9 in. high and nearly 3 lines thick; lower leaves broadly oblong or cuneate, obovate, coarsely serrate-toothed, narrowed at base into a winged petiole, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; upper leaves orbicular with cordate-clasping base, $\frac{3}{4}$ to 1 in. broad; petals white, with purple veins, 4 lines long; pods arcuate, $2\frac{1}{2}$ to 3 in. long, 1 line wide.

Montane species of the Coast Ranges: Hood's Peak, Sonoma Co.; Humboldt Co., *Chesnut* and *Drew*. This may be merely a form of *S. orbiculatus* but more abundant material is needed to settle the problem of relationships in this group.

2. *S. orbiculatus* Greene. Annual; herbage glabrous; main stem or ascending axis short, 1 to 3 in. long, bearing many ascending branches, or the branches at base spreading horizontally, 3 to 5 in. long; leaves rather small, lower spatulate-oblong, upper round, cordate-clasping; sepals pink or purple, 2 to 3 lines long; filaments distinct; pods falcate-recurved, mostly exceeding 2 in.

Summit of Mt. Diablo; Sierra Nevada from Mono Co. to Mt. Shasta.

3. *S. Breweri* Gray. Herbage glabrous and glaucous; stems 1 to 2 ft. high, branching from near the base; leaves mostly sessile and clasping, the lowermost broadly spatulate with a winged petiole, toothed, the cauline broadly ovate and acute to narrowly lanceolate, denticulate or entire; flowers 3 to 4 lines long, purplish; sepals acuminate; 2 pairs of filaments connate; pods ascending, short-pediceled, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long by $\frac{1}{2}$ line broad, ascending, slightly curved; stigma sessile or nearly so; seeds small, orbicular, wholly marginless.

Inner South Coast Ranges: Mt. Hamilton, Arroyo del Puerto and Mt. San Carlos.

4. *S. barbiger* Greene. Glabrous, 1 to 2 ft. high, branched; cauline leaves linear, entire; flowers white or purple, 3 lines long, subsessile; calyx saccate; sepals connivent, with recurved whitish tips; petals white, unequal; filaments dark purple, the upper pair connate and at length exserted; fruit $1\frac{1}{2}$ to 2 in. long, $\frac{1}{2}$ line wide, recurved. Colusa Co. to St. Helena. June.

5. *S. niger* Greene. Stout, $1\frac{1}{2}$ to 3 ft. high, much branched, the herbage glabrous and glaucous; leaves linear, the lower with shallow pinnate lobes or teeth, the upper entire and auriculate-clasping; racemes loose, flexuous; flowers 4 to 5 lines long, long-pediceled; calyx broad and saccate; sepals dark purple or black, obtuse; petals white; pods ascending, 1 to 2 in. long, 1 line broad, on pedicels 6 to 12 lines long; stigma entire, sessile; seeds broadly elliptical, narrowly winged.

Hills at Tiburon, Marin Co. Apr. Perhaps no more than a robust glabrous form of *S. glandulosus*.

6. *S. glandulosus* Hook. JEWEL FLOWER. Nearly simple or branched, 1 to 2 ft. high, the herbage more or less hispid; lower leaves oblanceolate, coarsely and often saliently toothed, at least the radical slender-petioled; upper lanceolate to linear, toothed or entire, sessile and auriculate-clasping, the teeth callous-tipped; flowers 5 to 6 lines long; calyx commonly deep purple; petals purple, or white with conspicuous purple veins; calyx broad and saccate; 3 sepals connivent at tips, the lower free from the others and usually spreading; longest pair of filaments often connate for their entire length and with

reduced anthers; pods curved, more or less spreading on short pedicels, glabrous or hispid, 2 to 3 in. long, 1 line wide; seeds elliptical, narrowly winged.—(*S. Bioletti*, *Mildredæ*, *albidus*, and *pulchellus* of Greene.)

Common in the mountains at middle altitudes, or at the highest altitudes in the hills.

7. *S. secundus* Greene. Either simple or with slender branches 10 to 18 in. high, the foliage similar to that of *S. glandulosus*; racemes rather dense, secund; flowers flesh-color, 4 lines long; remote lower sepal distinctly, the uppermost obscurely, unguiculate, all carinate and commonly hispid-ciliolate on the keel; petals with ample purple-veined crisped limb; upper pair of filaments connate to near their scarcely divergent tips, their anthers small but bearing pollen; pods slender, 2 in. long, falcate-recurved; seeds wingless.

Near the coast from Marin Co. northward to Mendocino Co. June. *S. pulchellus* Greene is intermediate between this and *S. glandulosus*.

8. *S. hispidus* Gray. Dwarfish, hispid throughout, branching, 3 to 6 in. high; leaves obovate to connate-oblong, coarsely toothed, all sessile except the very lowest; petals purplish with white tips, 3 or 4 lines long; sepals hispid with brownish hairs; pods erect or ascending, $1\frac{1}{2}$ to 2 in. long, 1 line wide, the pedicels short, about 1 line long; style short and stigma broad; seeds elliptical, winged.

Summit of Mt. Diablo, *Brewer*, May 14, 1862, southward to Fresno Co.

3. SISYMBRIUM L.

Erect annuals with pinnatifid or finely dissected leaves, the base not clasping or auriculate. Flowers small, yellow. Sepals oblong or linear, equaling or exceeding the claws of the petals. Silique linear, terete or nearly so, the valves more or less distinctly 3-nerved; stigma sessile or the style very short. Cotyledons incumbent. (Greek *sisymbrium*, the ancient name of some plant of the Mustard Family.)

Leaves pinnatifid; seeds in one row 1. *S. officinale*.
Leaves finely dissected; seeds in 2 rows 2. *S. pinnatum*.

1. *S. officinale* (L.) Scop. HEDGE MUSTARD. A little rough-hispid with scattered hairs; stem rigid, erect, 3 to 4 ft. high, with divaricate branches above; leaves lyrate and often somewhat runcinately pinnatifid or pinnately parted with dentate or coarsely toothed segments, petioled, the lowest rosulate and 4 to 10 in. long; flowers $1\frac{1}{2}$ to 2 lines in diameter; pods terete, 6 lines long, tapering from base to summit, nearly sessile, closely appressed to the axis in a long slender raceme.

Very common weed of waysides and waste places. Apr.—May.

2. *S. pinnatum* (Walt.). TANSY MUSTARD. Cinerous-tomentulose with short branching hairs, sometimes glabrate and green, $\frac{3}{4}$ to 2 ft. high; leaves pinnately or bipinnately dissected, thinnish

and delicate; segments small, elliptical or in the upper leaves linear-oblong; petals about 1 line long, equaling or exceeding the sepals; capsule oblong to linear, acute at each end and beaked with a very short style, 3 to 6 lines long, borne on slender spreading pedicels of equal or greater length.—(*S. canescens* Nutt.)

Livermore (acc. to Greene), the upper San Joaquin Valley, and southward to Southern California. Apr.

4. **CAKILE** L.

Maritime branching annual with fleshy leaves and rather small purplish or white flowers. Pod fleshy, or when ripe, dry and corky, 1-celled, jointed in the middle, the 2 joints 1-seeded, the upper joint at length deciduous, the lower one persistent. Cotyledons accumbent. (Arabic name.)

1. **C. Americana** Nutt. **SEA ROCKET.** Stems decumbent, often 2 ft. long; leaves oblanceolate or narrowly obovate, crenate or shallowly sinuate-toothed; pod 1 in. long or less, the lower segment cylindrical, the upper ovoid and acuminate narrowed to a flattened truncate often retuse beak.

Seashore about San Francisco and beaches of San Francisco Bay at West Berkeley.

5. **BRASSICA** L. **MUSTARD.**

Annuals, either glabrous or sparsely hispid with coarse hairs, the lower leaves usually lyrate pinnatifid or pinnate, the upper disposed to be more or less entire. Flowers large, yellow. Lateral sepals more or less gibbous at base. Petals with long claw and abruptly spreading limb. Papilla-like glands 4, green, alternating with the claws of the petals. Pod terete, terminating in a stout beak; valves 1 to several-nerved. Seeds in 1 row, globose. Cotyledons conduplicate, incumbent. (The Latin name for Cabbage.)

Pods terete, commonly 1 in. long or more, on ascending or spreading pedicels.

Beak terete; stem-leaves auriculate-clasping 1. *B. campestris*.

Beak 2-edged, often 1-seeded, much shorter than the body; stem-leaves petioled, or the upper merely sessile, none auriculate-clasping 2. *B. arvensis*.

• Beak very much flattened, longer than the white-hispid body; leaves all petioled 4. *B. alba*.

Pods somewhat quadrangular, closely appressed to the axis of the raceme, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; leaves all petioled 3. *B. nigra*.

1. **B. campestris** L. "COMMON YELLOW MUSTARD." Succulent, glaucous and glabrous save for bristle-bearing pustules on the upper surface of the lower leaves, erect, sparingly branched, 1 to 6 ft. high; cauline leaves all sessile and clasping by an auricled base; upper cauline lanceolate and entire; lower cauline irregularly serrate or denticulate, and pinnatifid or pinnate with the terminal segment very large and lateral segments sessile by a broad base and more or less decurrent on the rachis; radical leaves similar to the lower cauline, petioled; flowers 6 to 8 lines broad; sepals narrowly oblong,

yellowish, ascending; petals with elliptic blade; pods terete, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, narrowed into a subulate beak, tipped with a flat stigma.

Very common. Feb.-Apr. It is the Turnip of the gardens run wild.

2. **B. arvensis** (L.) B. S. P. CHARLOCK. Herbage light green, hispid with scattered hairs; leaves pinnatifid with a large shallowly lobed terminal segment and usually a pair of much smaller angular segments on the rachis, or ovate or triangular-ovate and lobed or denticulate; upper leaves deltoid-ovate to ovate-lanceolate, petioled or sessile by a narrow base, not clasping; petals 4 to 6 lines long; pods ascending or erect, 1 to $1\frac{1}{2}$ in. long, with 3 to 8 seeds in each cell; beak flattish, $\frac{1}{3}$ as long as the body, often containing a seed; valves nerved. —(B. Sinapistrum Boiss.)

Frequent in western Alameda Co. Apr.

3. **B. nigra** (L.) Koch. BLACK MUSTARD. Dark green (not glaucous), nearly glabrous or with some scattered stiff hairs, 3 to 6 or even 12 ft. high; leaves all petiolate; lower lyrate pinnatifid or divided; terminal segment very large, shallowly lobed and sharply dentate; upper leaves less lobed or the uppermost linear and entire and commonly drooping or pendulous; racemes long and dense; petals $3\frac{1}{2}$ lines long, much larger than the sepals; pods closely appressed to the axis of the raceme, torulose, indistinctly 4-sided, beaked by the style; seeds nearly black, highly pungent.

Naturalized weed, everywhere common and very abundant in interior grainfields. May-July.

4. **B. alba** Boiss. Stem 1 to 2 ft. high; leaves all pinnately lobed or divided and rather long-petioled, or the upper lanceolate or oblong, merely dentate and short-petioled; racemes 3 or 4 in. long, rather dense; pedicels in fruit spreading horizontally; pod hispid with white hairs, the body shorter than the long conspicuously flattened beak.

European weed, perhaps not yet naturalized: Byron, *Bioletti*.

6. **RAPHANUS** L. RADISH.

Coarse much-branched annuals or biennials. Lower leaves lyrate pinnate or pinnatifid, shortly petioled. Flowers large, purple or yellow, or becoming white. Petals long-clawed. Pod thick, beaked by the stout style, 1-celled, filled with spongy or corky tissue, lightly constricted between the seeds or even moniliform, indehiscent or eventually breaking transversely into 1-seeded joints. Seeds subglobose, cotyledons conduplicate. (Greek raphanos, quick-appearing, on account of the prompt germination of the seeds.)

Flowers purple, pink or white; pod with shallow constrictions, 2 to 3-seeded. 1. *R. sativus*.
Flowers yellow or white; pod moniliform, 4 to 10-seeded. 2. *R. Raphanistrum*.

1. **R. sativus** L. WILD RADISH. Nearly glabrous or hispid with scattered hairs; stem branching widely, 2 to 5 ft. high; lower leaves pinnately parted, all the segments crenate, the terminal segment large and round, the lateral smaller, ovate or oblong, sessile with the

upper side adherent to the midrib, the lower lobe free; upper leaves mostly toothed, or with a few small lateral segments; flowers 8 or 9 lines broad, purple or white; pod thick, spongy at maturity, 3 to 4 lines broad, 1 to 3 in. long, with one to several constrictions, or the body of the pod globose and 1-seeded.

Common weed of waste places in towns and villages about San Francisco Bay; less frequent in the interior. Naturalized.

2. **R. Raphanistrum** L. JOINTED CHARLOCK. Plants $1\frac{1}{2}$ to 2 ft. high, almost glabrous throughout; lower leaves deeply lyrate-pinnatifid, 4 to 7 in. long, the upper less lobed; flowers 6 to 9 lines broad, yellow or white; pods 1 to $1\frac{1}{2}$ in. long, 6 to 10-seeded, strongly constricted between the seeds, longitudinally grooved.

Introduced from Europe but very rare and scarcely established: San Francisco; Berkeley.

7. **ERYSIMUM** L. WALL FLOWER.

Erect stoutish biennials or perennials, simple or with few branches. Leaves narrow, entire, dentate or lobed. Flowers large, orange to light yellow. Sepals narrow, equal at base or the lateral saccate. Petals with slender claws and obovate blades. Pod linear, flattened, with 1-nerved valves, or quadrangular. Seeds in 1 row, numerous, not margined. (Greek name of a garden plant.)

Flowers orange; pod 4-sided; montane species 1. *E. asperum*.
Flowers cream-color or yellowish; pod flattened parallel to the partition;
littoral species 2. *E. capitatum*.

1. **E. asperum** DC. WESTERN WALL-FLOWER. Herbage scabrous-pubescent, hairs stellately 3-parted; stems erect, simple or branching above, $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high, rather densely clothed with leaves below; leaves narrow (2 to 6 lines wide and 3 to 6 in. long, or the uppermost shorter), entire or sharply dentate, the lower slender-petioled; flowers orange, 10 lines in diameter; blade of petal broadly elliptic; sepals narrow, with a longitudinal dorsal ridge; pods 4-sided, ascending or widely spreading, commonly 3 to 4 in. long, 1 line wide, beaked with a stout style; seeds oblong, often slightly winged at one end.—(*E. Californicum* Greene.)

Common on rocky hills in the mountains of the Coast Ranges and Sierra Nevada. Mar.–Apr.

2. **E. capitatum** (Dougl.) Greene. Stout and low, erect, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, leafy, finely pubescent; leaves narrow, entire or repand-dentate; flowers cream-color to yellowish, rarely white, at first subcapitate, the axis elongating in fruit and becoming a short raceme; pods $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, $1\frac{1}{2}$ lines wide, abruptly short-pointed; valves flattish, 1-nerved; seeds brown, sometimes margined but not winged—(*E. grandiflorum* Nutt.)

Vicinity of the ocean along the California coast.

8. **ARABIS** L. ROCK CRESS.

Ours erect and tall annuals or biennials, or caespitose perennials. Flowers rose-purple, white or yellowish white. Sepals greenish or

purplish, erect and equal, or the lateral pair slightly saccate at base. Petals obovate or spatulate, with narrow claw and flat blade, commonly much exceeding the sepals. Pod flattened parallel to the partition, the valves more or less 1-nerved. Seeds more or less winged; cotyledons accumbent, or in one species partially incumbent. (Name from the land Arabia.)

Leaves all pinnately parted; plants decumbently branching from the base; flowers small, white. 1. *A. Virginica*.

Leaves entire, toothed or only the radical pinnatifid.

Tall biennials with white flowers; sepals greenish.

Glaucous; glabrous except at the base 2. *A. glabra*.

Not glaucous; hirsute throughout 3. *A. hirsuta*.

Low, more or less tufted perennials; sepals purplish, rarely greenish.

Herbage dark green, mostly glabrous; pods nearly straight; seaboard species 4. *A. blepharophylla*.

Herbage more or less canescent; pods arcuate; montane species 5. *A. Breweri*.

1. *A. Virginica* (L.) Trelease. Annual or biennial, nearly glabrous; branched from the decumbent base, the branches 7 to 15 in. high; leaves deeply pinnatifid with nearly uniform oblong or linear few-toothed or entire segments; flowers small, white, on very short pedicels; pods spreading, $\frac{3}{4}$ to 1 in. long, 1 line broad, borne on pedicels 1 to 2 lines long, beaked by a short pointed style; valves faintly veined or obscurely 1-nerved at base; seeds in 1 row.—(*A. Ludoviciana* C. A. Mey.)

Lower San Joaquin River banks, *Sanford*; probably introduced from Southern California.

2. *A. glabra* (L.) Bernh. TOWER MUSTARD. Biennial, erect, simple (very rarely branched), 2 to 4 ft. high; herbage glaucous, at the base hispidulous, above glabrous; radical leaves broadly spatulate, coarsely dentate or merely denticulate, 2 to $4\frac{1}{2}$ in. long, soon withering; cauline leaves ovate or ovate-lanceolate, entire, clasping by a sagittate base; flowers dull white, 2 to 3 lines long, little exceeding the sepals; pods strictly erect, even appressed to the stem, straight, 3 to 4 in. long, $\frac{1}{2}$ to $\frac{3}{4}$ line wide, on pedicels 3 to 5 lines long; seeds in 2 rows, narrowly winged or wingless.—(*A. perfoliata* Lam.)

Throughout California: not rare, but the plants commonly solitary. Apr.—May.

3. *A. hirsuta* Scop. HAIRY ROCK CRESS. Biennial, more or less hirsute, deep green, not glaucous; stems erect, simple or strictly branched, 1 to 3 ft. high; radical leaves oblanceolate, the petioles winged, 1 to 2 in. long; cauline oblong to lanceolate, commonly entire, sessile by a subcordate base; petals dull white, $1\frac{1}{2}$ to 3 lines long; pods strictly erect on slender pedicels, 1 to 2 in. long, $\frac{1}{2}$ line wide; style scarcely any; valves faintly nerved below the middle and more or less veined; seeds suborbicular, very narrowly margined.

Northern California: Marin Co. (acc. to Greene).

4. *A. blepharophylla* H. & A. Biennial or perennial, branched at base or simple, 4 to 12 in. high, deep green, glabrous, or somewhat hirsute below; radical leaves broadly spatulate to obovate, obtuse,

ciliate with forked hairs; cauline oblong, sessile, dentate or entire; flowers large, fragrant, purple, $\frac{1}{2}$ in. long; sepals often colored, broad, 2 to 3 lines long; pods erect or ascending, nearly straight, $\frac{3}{4}$ to 1 in. long, 1 line wide, abruptly beaked by a short stout style; valves veined, 1-nerved; seeds in 1 row, round-elliptical, narrowly winged or scarcely margined.

Rocky hilltops from San Francisco to Monterey. Mar.-Apr.

5. **A. Breweri** Wats. BREWER ROCK CRESS. Stems many from the much branched crown of a stout woody root, 2 to 6 in. high; herbage stellately pubescent or canescent, especially below; lower leaves broadly spatulate, entire, 3 to 9 lines long; upper leaves lanceolate to oblong, sessile by a subcordate base or obtusely auriculate; flowers bright red-purple or nearly white, 2 to 3 lines long, the pedicels and purplish calyx more or less villous; pods spreading and arcuate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, 1 line broad; valves 1-nerved, veined; seeds orbicular, narrowly winged, somewhat in 2 rows.

Rocky summits of mountain peaks from borders of Lake Co. southward to Mt. Diablo, Mt. Hamilton and Loma Prieta. Apr.

9. **BARBAREA** R. Br.

Perennial herbs similar to the yellow-flowered *Nasturtiums*. Stem angular. Leaves lyrate or pinnatifid. Stamens 6, distinctly tetradynamous. Pods linear, somewhat quadrangular, abruptly terminated by a pointed style, the valves strongly 1-nerved or carinate. Seeds in 1 row in each cell, turgid, not margined. (Named after St. Barbara.)

1. **B. vulgaris** R. Br. WINTER-CRESS. Glabrous, rather stout, 10 to 16 in. high; radical leaves elliptic, sometimes cordate at base, $\frac{3}{4}$ to 2 in. long, with or without small supplementary lobes borne along the petiole; cauline similar, pinnatifid, with the terminal lobe largest and often oblong-lanceolate; raceme terminal and solitary or with several from the upper axils; petals narrowly obovate or oblanceolate, the blade scarcely narrowed into a claw, about 3 lines long, twice as long as the yellow sepals; pod $1\frac{1}{2}$ in. long.

Along streams in the mountains or among the hills: Coast Ranges and Sierra Nevada. June-July.

10. **NASTURTIIUM** L.

Nearly or quite glabrous annuals or perennials, sometimes growing in water, mostly in wet places. Leaves toothed or pinnatifid or pinnately divided. Flowers small, white or yellow. Sepals spreading in anthesis. Petals scarcely clawed. Stigma capitate, nearly sessile. Pod linear or oblong, terete or nearly so, valves mostly 1-nerved. Seeds minute, in 2 rows in each cell; cotyledons accumbent. (Nasus, nose, and tortus, twisting, the nostrils affected by the pungent herbage.)

Flowers white; petals distinctly clawed, nearly twice the length of the sepals. 1. *N. officinale*.
Flowers yellow; petals scarcely clawed, little longer than the sepals.
Pods linear, curved upward. 2. *N. curvisiliqua*.
Pods oblong, turgid, straight. 3. *N. palustris*.

1. *N. officinale* R. Br. WATER-CRESS. Stems ascending or prostrate at base and rooting at the nodes, the herbage glabrous; leaflets or segments 3 to 9, ovate or nearly round, the terminal always the largest, or the lowest leaves without lateral leaflets; flowers white, 2 to $2\frac{1}{2}$ lines broad; petals nearly twice the length of the sepals; pods divaricately spreading, $\frac{1}{2}$ to 1 in. long, the pedicels about as long.

Common in slow-flowing creeks and about springs in the mountains. Naturalized.

2. *N. curvisiliqua* Nutt. WESTERN YELLOW-CRESS. Stems branching, erect or decumbent, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long; herbage sparsely pubescent; leaves pinnatifid or pinnately parted (the segments varying from linear and commonly entire to oblong or ovate and either entire, toothed or pinnatifid), mostly $\frac{3}{4}$ to 2 in. long, or the lowest or radical much longer; pods linear, terete, more or less curved, 4 to 7 lines long, the pedicel $\frac{1}{2}$ to $1\frac{1}{2}$ lines long.

Frequent in stream beds, margins of pools and marshy places, from San Mateo Co. and the Oakland Hills northward through the Coast Ranges and the Sacramento Valley. Exceedingly variable in foliage; radical leaves of a robust plant from the Napa River near St. Helena are bipinnatifid and 1 ft. long. The var. *lyratum* Wats. has coarsely toothed leaves broad above and narrowed towards the base.

3. *N. palustris* DC. MARSH YELLOW-CRESS. Biennial, erect, branching, 2 to 5 ft. high, usually glabrous; leaves oblong-lanceolate in outline, coarsely toothed or deeply pinnatifid with the oblong lobes dentate; pods oblong, turgid, 2 to 3 lines long, obtuse, the pedicels nearly as long.

Lowlands of the Sacramento River.

N. dictyotum Greene, collected on Grand Island, is teratological; stems more or less fasciated; pods often 3 or 4-valved and placentæ 3 or 4; pods at intervals crowded.

11. DENTARIA L. TOOTHWORT.

Glabrous perennials. Stems and one or two long-petioled radical leaves from tuberous rootstocks, the stems rarely branched and sparingly leafy. Flowers large, white or rose-tinted, appearing in early spring. Petals with slender claws and ovate spreading limb, much longer than the sepals; these equal at base, erect or nearly so. Pod linear, flattened parallel to the partition, stout, attenuate above into the slender style, the valves and partitions not nerved; seeds wingless. (From the Latin, *dens*, a tooth, the rootstocks toothed in some species.)

Leaves (at least the cauline) trifoliate 1. *D. integrifolia*.
Leaves all undivided 2. *D. cardiophylla*.

1. *D. integrifolia* Nutt. MILK-MAIDS. Stems mostly one from the rootstock, erect, 1 ft. high, the herbage rather fleshy; radical leaves simple or trifoliate, the leaves or leaflets mostly orbicular, minutely dentate, and $\frac{1}{2}$ to 1 in. long; cauline trifoliate, ovate to

lanceolate; raceme mostly single; corolla white, 6 lines broad; sepals green or dull red; siliques with dull red valves.

Abundant in the valleys and on the plains, often whitening the fields in Feb. and Mar. Propagating vegetatively by the production of roots at the summit of the petiole of the radical compound leaf. Exceedingly variable. The most marked variety is the following:

Var. **Californica** (*Dentaria Californica* Nutt.)—Taller and more slender, leaves larger, comparatively thin, the radical often dull reddish beneath and sometimes 5-foliolate; corolla white or pale rose-color.—Shady woods. Mar.—May. Exceedingly variable in its leaves, the cauline sometimes pinnately parted and the radical as frequently simple, as in the species.

2. **D. cardiophylla** (Greene) Robinson. Erect, stoutish, 8 to 13 in. high; radical leaves undivided, broadly cordate, slightly and somewhat angulately lobed and mucronately denticulate, 1 to 2½ in. wide; cauline similar, tapering from within the broad sinus to a petiole ½ to 1 in. long; flowers white; siliques slender-beaked.—(*Cardamine cardiophylla* Greene.)

Vaca Mountains at low altitudes, *Jepson* (1885), *Platt* (1898).

12. CARDAMINE L. BITTER-CRESS.

Ours annual with fibrous roots and leafy stems; leaves pinnate, the radical in a rosette. Very near *Dentaria* and scarcely separable, but the flowers smaller (in ours 1 to 1½ lines long) and pods narrower. (Ancient Greek name of some species of Cress.)

1. **C. oligosperma** Nutt. Erect, slender, unbranched or with several very slender branches 3 to 14 in. high, hispidulous or nearly glabrous; stems slender, commonly branching, 3 to 9 in. high; radical leaves in a rosette, these and the cauline leaves pinnate, 1½ in. long or less; leaflets 5 to 11, little unequal, with a notch in each side toward the apex, 1 to 4 lines long, petiolulate; petals white, much surpassing the sepals; silique 6 to 9 or 12 lines long; valves separating and falling in a close coil while still green-herbaceous; pedicels 2 lines long, little accrescent in fruit.

Under Oaks and other trees in openly wooded country. Oakland Hills and Marin Co. northward to Napa Valley and Mendocino Co.

13. TROPIDOCARPUM Hook.

Erect or diffusely spreading annuals with pubescent herbage, pinatifid leaves and leafy racemes of rather small yellow flowers. Sepals concave, ovate-oblong, spreading. Petals cuneate-obovate. Stamens tetradynamous; anthers roundish. Style slender, sometimes short. Pod completely or partially 2-celled, or 1-celled, strongly flattened contrary to the narrow partition, or only the upper part flattened, or somewhat inflated; valves 2 to 4, opening from above; seeds in 2 to 4 rows. (Greek *tropis*, keel, and *karpos*, fruit, in reference to the carinate valves of the capsule. For an interesting study of the fruit of *Tropidocarpum* see Robinson in *Erythea*, iv. 109.)

Plants, when robust, with mostly straggling branches; pods 2-valved and

Two-celled 1. *T. gracile*.

One-celled, but the partition persistent above. 2. *T. dubium*.

Plants commonly erect; pods 4-valved and 1-celled 3. *T. capparideum*.

1. ***T. gracile* Hook.** Erect or at last very diffuse; leaves pinnatifid, the segments commonly linear, acutish, cleft or entire; leaves of the inflorescence similar but reduced; pedicels axillary, 3 to 10 lines long, spreading; stamens very unequal; pods linear, strongly obcompressed throughout, tardily dehiscent; style slender; seeds in 2 rows.

On or near low hills of the inner Coast Ranges from Tehama Co. and the Marysville Buttes southwestward to Vacaville, Mt. Diablo and Southern California.

2. ***T. dubium* Davidson.** Decumbent, the branches 6 to 12 in. long; radical leaves regularly pinnatifid with 3-toothed segments, petioled, 2 to 3 in. long; cauline leaves mostly sessile with linear segments; stamens tetradynamous, but not markedly unequal; pedicels said to be arcuate; pods $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, 1 line wide, only the upper portion obcompressed; partition not present, except in the upper $\frac{1}{3}$ or $\frac{1}{4}$.

Antioch (acc. to Robinson in Gray, Syn. Fl.) and Southern California.

3. ***T. capparideum* Greene.** Stem stoutish, erect, mostly less than 1 ft. high, simple or sparingly branched; foliage as in *T. gracile*, the upper leaves somewhat more deeply parted and with longer subentire segments; pods linear-oblong, 7 to 10 lines in length, 2 lines wide, somewhat inflated, 1-celled, conspicuously 6-nerved, tipped with a slender style; valves 4, the dehiscence beginning at the apex; seeds in 4 distinct rows.

Alkaline soil from Byron to Lathrop. Mr. C. D. Cobb sends us from the Lower San Joaquin a box of 40 ripe fruits, each capsule having an inner capsule containing a perfect seed.

14. **CAPSELLA** Medic.

Slender annuals with pinnatifid leaves and small white flowers. Petals small, little exceeding the calyx. Pod obcordate or elliptical, strongly or scarcely at all flattened, several-seeded; valves carinate. Seeds not winged; cotyledons incumbent. (Capsella, a little box, in allusion to the fruit.)

Pod obcordate, or cuneate-triangular in outline with retuse apex, strongly flattened

Pod elliptic-oblong, scarcely flattened, entire at the apex. 1. *C. Bursa-pastoris*. 2. *C. procumbens*.

1. ***C. Bursa-pastoris* Mœnch.** SHEPHERD'S PURSE. Stems erect, simple or branching, 3 to 10 or 15 in. high, sparsely hispid; radical leaves in a spreading rosette; lower leaves petioled, pinnatifid, rarely entire, the terminal lobe largest; upper leaves merely dentate, sessile-auriculate; petals white, less than 1 to $1\frac{1}{2}$ lines long, slightly exceeding the sepals; pedicels elongating in fruit, 4 lines long; pods obcordate, $2\frac{1}{2}$ to 3 lines broad, many-seeded, strongly flattened.

Common in pastures, orchards and by waysides; naturalized from Europe.

2. **C. procumbens** (L.) Fries. Three to 6 in. high with ascending branches from the base; leaves oblanceolate or spatulate, or the lower more or less pinnatifid; flowers minute, $\frac{1}{2}$ line long or less; sepals ovate-elliptic, thin-margined, about equaled by the white petals; pods elliptic-oblong, entire at the apex, 1 to $1\frac{1}{2}$ lines long, pedicels filiform, in fruit 3 or 4 lines long and divaricately spreading. — (*C. elliptica* C. A. Mey. *C. divaricata* Walp.)

Alkaline soil from Alameda and Byron southward to Kern Co.

15. **CAMELINA** Crantz.

Erect annual with sagittate-clasping leaves. Flowers small, yellow, in loose racemes. Pod obovate or pear-shaped, beaked with the slender, persistent style; valves convex with the edges flattened, forming a narrow margin around the pod; partition broad; seeds several in each cell, oblong, marginless; cotyledons incumbent. (Greek camai, dwarf, and linon, flax.)

1. **C. sativa** Crantz. FALSE FLAX. Stem simple or branching above, $1\frac{1}{2}$ to 2 ft. high, leafy, nearly glabrous; leaves oblong to lanceolate, entire or dentate; flowers rather small, light yellow; pedicels in fruit ascending; pods $3\frac{1}{2}$ or 4 lines long, 2 to $2\frac{1}{2}$ lines broad.

Old World weed of grain fields. Rare in California.

16. **ATHYSANUS** Greene.

Low annual, leafy below, the short stem divided at or near the base into few or many simple elongated filiform branches or racemes which are unilaterally flower-bearing throughout. Flowers minute, promptly reflexed or recurved. Petals linear or none. Stamens 6, nearly or quite equal; filaments slender. Pod small, orbicular, indehiscent, 1-celled, or 2-celled by a thin partition, wingless; cotyledons accumbent. (Greek a-, without, and thusanos, fringe, the fruit wingless, the species taken out of the genus *Thysanocarpus*, whose fruit is broadly margined.)

Pods plane, numerous on the racemes.

Pods twisted at maturity; raceme lax, the pods often distant 1 in. or more.

1. *A. pusillus*.

2. *A. unilateralis*.

1. **A. pusillus** (Hook.) Greene. Herbage pubescent with simple or branching hairs; racemes 3 to 9 in. long; leaves broadly oblong with about 3 coarse teeth on each side, 3 to 5 lines long, rarely varying from 2 to 9 lines; ovary 1-celled; ovules 2 to 4, only one maturing, that attached at base of the pod; fruiting pedicels recurved, 1 to 3 lines long; pods orbicular, strongly flattened $\frac{3}{4}$ to 1 line long, hispid all over with hooked hairs.

Common everywhere on low hills and gravelly plains in the Coast Ranges; also in the Sierra Foothills at Rough and Ready.

2. **A. unilateralis** (Jones). Habit of the preceding; racemes lax, diffuse, or horizontal and trailing, in age rigid and wiry, 6 to 18 in. long; pods round-oval, 1 to $1\frac{1}{2}$ lines broad, hispidulous, twisted when mature, the pedicels thick, recurved, $\frac{1}{2}$ to 1 line long; seeds 6 to 10. — (*Heterodraha unilateralis* Greene.)

Hillsides and valleys of the inner Coast Ranges from Colusa Co. to Livermore Valley and southward. Apr.

17. THYSANOCARPUS Hook.

Slender erect annuals, with the stems commonly sparingly branched or often simple, and minute white or purplish flowers. Sepals ovate, spreading. Petals spatulate. Stamens 6, subequal, with slender filaments. Ovary 1-celled, 1-ovuled, becoming an indehiscent fruit; this much flattened and winged, orbicular in outline, the body disk-shaped or plane on one side and convex on the other, the wing with small perforations or with radiating nerves or toothed. (Greek thusanos, fringe, and karpos, fruit).

Fruiting pedicels more or less recurved their whole length.

Wing of the obovate fruit with radiating nerves, mostly imperforate . . .

1. *T. curvipes*.

Wing of the commonly roundish fruit perforated. . . . 2. *T. elegans*.

Wing of fruit scarious, not perforated, the radiating nerves none or very short . . . 3. *T. emarginatus*.

Fruiting pedicels straight or recurved only at the very tip; wing broad with conspicuous rays 4. *T. radians*.

1. ***T. curvipes* Hook.** FRINGE-POD. More or less pubescent or hirsute, 10 to 20 in. high; cauline leaves linear or lanceolate, sessile and auricled at base, the upper entire, the lower dentate or denticulate; radical leaves often narrowed at base to a petiole, commonly sinuate-pinnatifid, with triangular acute or acuminate lobes; fruit obovate varying to round-obovate, pubescent or glabrous, $1\frac{1}{2}$ to 3 lines long, often very convex on one side; wing narrow, rather crowded with broad rays; pedicels recurved.

Frequent everywhere in the open hill country of California. Apr.-May. Pods in the same raceme sometimes either pubescent or glabrous, indifferent of age. Passing into the next by numerous gradations, of which *T. hirtellus* Greene is one.

2. ***T. elegans* F. & M.** LACE-POD. Rather stout, with few branches; lower leaves repand-toothed; fruit nearly orbicular, 3 to 4 lines long, the body densely tomentose; wing with large ovoid perforations between the rays, the margin membranaceous and entire.

Middle North Coast Ranges; Antioch; Sierra Foothills.

3. ***T. emarginatus* Greene.** Freely branching from the base, $1\frac{1}{2}$ ft. high; herbage ostensibly glabrous but the plant at the fruiting stage hispidulous under a lens, at least on the lower parts; cauline leaves linear, lanceolate, sessile, not auricled; flowers and radical leaves unknown; fruit 2 to $2\frac{1}{2}$ lines long, glabrous; the wing scarious, entire, destitute of radiating nerves or these very short, sometimes deeply, always slightly emarginate at the apex.

Mt. Diablo, *Jepson*; Antioch, *Miss Eastwood*. Evidently passes into *T. curvipes*.

4. ***T. radians* Benth.** Erect, commonly 1 to $1\frac{1}{2}$ ft. high and rarely branching; radical leaves runcinate-pinnatifid; cauline ovate-lanceolate, auriculate-clasping; fruit orbicular, 4 lines broad, glabrous

or tomentose, the edge of the body divided into radiating spoke-like nerves which disappear abruptly just within the margin of the white-membranaceous wing; pedicels straight, abruptly recurved at the very summit.

Low hills or rolling plains, infrequent: Healdsburg; Sonoma; Vacaville; Antioch; and Linden (San Joaquin Co.). Apr.-May. Var. *montanus* is a color form; branches several from the base, ascending, 5 to 8 in. high; fruit 3 lines long, the wing bright purple. —Plateau of the Napa Mountains, north of Mt. George, *Jepson*, Apr. 28, 1893.

18. *ALYSSUM* L.

Low-branching herbs with undivided leaves. Flowers white or yellowish, in ours 2 lines long or less. Filaments of the stamens winged near the base or toothed. Pod orbicular, with convex veinless valves and broad partition; seeds 1 or 2 in each cell. (A-, without, and lussa, madness, the plant valued by the ancient Greeks as an antidote for hydrophobia.)

Petals yellowish white, scarcely exceeding the sepals; these persistent about the base of the fruit 1. *A. calycinum*.
Petals white, twice as long as the deciduous sepals 2. *A. maritimum*.

1. *A. calycinum* L. SMALL ALYSSUM. Annual; stems branching from the base, decumbent, 4 to 7 in. high; leaves linear-oblong or spatulate; petals yellowish white, little exceeding the persistent sepals; filaments of the shorter stamens toothed at the base; pod notched at the apex, $1\frac{1}{2}$ lines broad; seeds 2 in each cell.

An escape from gardens; not common.

2. *A. maritimum* (L.) Lam. SWEET ALYSSUM. Perennial, ostensibly glabrous, the stems procumbent or ascending, 4 to 12 in. long; leaves narrowly lanceolate or linear; petals broad, white, twice the length of the sepals; sepals falling off after flowering; filaments without appendages; seeds 1 in each cell.

European species of the gardens, more or less naturalized in California.

19. *LEPIDIUM* L. PEPPER-GRASS.

Ours low annuals (commonly less than $\frac{1}{2}$, seldom 2 ft. high) with toothed pinnatifid leaves and very small flowers (1 line long or less). Petals white or none. Stamens 6, 4 or 2. Pod a round, ovate, or broadly oblong silicle, strongly obcompressed, and in ours notched or lobed at the more or less winged apex; valves acutely carinate, the cells 1-seeded. Style not persistent in fruit. Cotyledons incumbent. (Greek *lepidion*, a little scale, in reference to the flattened pods.)

L. *DRABA* L., Hoary Cress, is occasionally found as an escape from the gardens; leaves large, elliptic-obovate or lanceolate; pod somewhat cordate, neither notched nor winged, tipped with a stout style.—Napa Valley.

Silicle notched at apex; not reticulated or only faintly.

Petals present; erect plants.

Leaves toothed; pedicels terete 1. *L. medium*.

Lower leaves pinnatifid; pedicels flattened 2. *L. nitidum*.

Petals none; plants diffuse or prostrate; leaves pinnatifid 3. *L. bipinnatifidum*.

Silicle winged at apex with two lobes or teeth and

Conspicuously reticulated; dwarfs with mostly prostrate or decumbent stems; wings or teeth approximate or parallel and

Nearly as long as the body 4. *L. latipes*.

Very short 5. *L. dictyotum*.

With finer reticulations; teeth divergent.

Pedicels erect or ascending, shorter than the silicles; teeth very prominent; sinus triangular 6. *L. strictum*.

Pedicels spreading or retrocurved; larger than the silicles; sinus broad and rounded 7. *L. oxycarpum*.

1. *L. medium* Greene. TALL PEPPER-GRASS. Stem erect, 1 to 2 ft. high, simple below, paniculately branching above and bearing numerous racemes 2 to 3 or even 6 in. long; herbage ostensibly glabrous; leaves oblanceolate (the radical oblong), narrowed at base to a petiole, sharply serrate, 2 to 3 in. long; rameal leaves linear, serrate only towards the apex, shorter; petals white; silicles round, $1\frac{1}{2}$ lines long, nearly as broad, notched at the very narrowly winged apex; pedicels 2 lines long, widely (or even horizontally) spreading.

Common in Scott Valley, Lake Co. and southward to Napa Valley. Described by Greene as apetalous.

2. *L. nitidum* Nutt. COMMON PEPPER-GRASS. TONGUE-GRASS. Branching from or near the base, 1 to 6 or 10 in. high, the branches mostly simple; herbage glabrous; leaves 4 in. long or less, the upper almost or quite entire, the lower pinnatifid with the rachis ligulate and bearing remote entire or laciniately toothed lobes; petals white, less than 1 line long, obovate, with no distinct claw; stamens 6, but the 2 shorter mere rudiments; silicles round, with a narrow margin, abruptly notched at apex, $1\frac{1}{2}$ to 2 lines long, plane on the upper face, convex on the lower, often dark purple, glabrous and shining.

Common everywhere on the Californian plains, low hills and in the valleys. Feb.-Apr.

3. *L. bipinnatifidum* Desv. WAYSIDE PEPPER-GRASS. Stems 3 to 6 in. long, freely branching from the base, diffuse or even prostrate, the plants often closely matting the ground; herbage light green, puberulent or glabrate; leaves pinnatifid or the lowest bipinnatifid; racemes numerous, dense and rather narrow; petals none; silicles round, nearly $1\frac{1}{2}$ lines long, glabrous, faintly reticulate, the teeth at the apex short and obtuse; fruiting pedicels ascending, scarcely exceeding $\frac{1}{2}$ line.

Common in hard beaten soil, by paths and waysides, throughout California.

4. *L. latipes* Hook. LONG-WINGED PEPPER-GRASS. Stems several from the base, very thick and stout, 1 to 2 in. long, recurved-prostrate; herbage slightly pubescent; leaves pinnatifid with few linear acute segments, 3 to 5 in. long, the rachis ligulate, 2 lines broad, often dilated into a terminal lanceolate lobe; segments remote, 5 to 6 lines long; racemes very dense, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; petals broadly spatulate, greenish, rounded at the apex, 1 line long, much exceeding the short sepals; silicles broadly oblong or oval, 3 lines long, 2 lines

broad, strongly reticulated, sparingly pubescent, winged at apex with two broad acute teeth nearly as long as the body, the sinus between the teeth or wings a narrow cleft.

Beds or margins of winter pools on the plains or in alkaline flats. Common in the Sacramento Valley and found in the Coast Ranges from Round Valley (Mendocino Co.) to Napa Valley, Mt. Diablo region, Hollister and southward to Southern California. Mar.-May, fruiting June-July.

5. *L. dictyotum* Gray. Branches several from the base, decumbent, or at length ascending, 1 to 2 in. long; leaves pinnatifid, the segments few, linear and remote; petals little exceeding the sepals or wanting; silicles $1\frac{1}{2}$ lines long, broadly elliptic, finely reticulated, pubescent, with short obtuse wings or teeth at the summit, the sinus narrow; pedicels ascending, flattened.

Alkaline soils from Alameda (acc. to Greene) and Livermore southward to Southern California. Mar.-Apr.

6. *L. strictum* Rattan. Branching from the base, the branches comparatively simple, suberect or diffuse, 4 to 12 in. high; leaves with few pinnate segments or entire; stamens 4; silicles glabrous, lightly reticulated, 2 to $2\frac{1}{2}$ lines long, with 2 widely divergent lanceolate wings or teeth at apex often $\frac{1}{2}$ as long as the elliptic body; pedicels flattened, in fruit rather shorter than the pod.—(*L. Oreganum* Greene, Fl. Fr. in part.)

Lower San Joaquin and the Montezuma Hills. First collected by Rattan in the "Live Oaks of the Mokelumne River, 1878."

7. *L. oxycarpum* T. & G. Very slender, branched from the base, the branches elongated, erect or ascending, 4 to 6 in. long, bearing flowers more than half their length; leaves narrow, linear and subentire, or pinnatifid with a few acute linear segments; pedicels widely spreading or deflexed, more slender than in the other members of the group, $1\frac{1}{2}$ lines long; sepals very unequal, caducous, $\frac{1}{2}$ line long; petals none; stamens 2; silicle roundish, glabrate, finely reticulated, $1\frac{1}{4}$ lines long, tipped with 2 very short and acute widely divergent teeth; pedicels widely spreading or retrocurved, very slender, flattened, longer than the pods.

Borders of salt marshes or in alkaline soils in middle California toward the coast: Vallejo; Berkeley Hills; Alviso.

20. *CORONOPUS* Gærtn.

Prostrate annuals (exhaling a heavy-scented odor), with pinnatifid leaves and short racemes of minute greenish white flowers. Sepals oval, equal at base, spreading. Stamens often only 2 or 4. Silicle small, more or less didymous, flattened contrary to the narrow partition, the surface strongly wrinkled or tuberculate; valves of the pod falling away at maturity from the persistent axis as closed or nearly closed nutlets. Cotyledons incumbent. (Greek korono, crow, and pous, foot, because of the shape of the leaves.)

Fruit notched at summit and at base, strongly didymous, wrinkled	1. <i>C. didymus</i> .
Fruit not notched above, obscurely didymous, strongly roughened and crisate-muricate	2. <i>C. Ruellii</i> .

Naturalized weed near dwellings: Montezuma Hills, Solano Co.

Naturalized weed: San Francisco.

39. CAPPARIDACEÆ. CAPER FAMILY.

Stipules fimbriate, 1 to 2 lines long; capsule 1-celled, the valves falling away from the placenta 1. CLEOMELLA.
Stipules consisting of minute bristles; capsule 2-celled, 2-seeded, each valve closely investing its seed and falling away with it 2. WISLIZENIA.

1. CLEOMELLA DC.

1. **C. obtusifolia** Torr. Branching from the base, 3 in. to 1½ ft. high, finely pubescent or hairy; leaflets broadly obovate to oblong, shorter than the petioles; stipules deciduous; petals 2 lines long; sepals ciliate or almost fimbriate, very much shorter than the petals; pods 2 to 4 lines broad; stipe 3 lines long, reflexed upon the pedicel. Sacramento, *Fremont*; said to have been re-collected in the same locality in recent years.

2. **WISLIZENIA** Engelm.

Erect branching rank-scented annuals. Leaves with 3 leaflets and

with minute deciduous bristles for stipules. Flowers yellow. Stamens with long filiform filaments, much exserted. Stipe in fruit refracted upon the pedicel. Pod 2-seeded and didymous; each valve closely contracted upon its seed and falling away with it, therefore like a nutlet. (Dr. A. Wislizenius, who collected in early days in California.)

1. **W. refracta** Engelm. STINK-WEED. One to 2 or even 6 ft. high; leaflets obovate to oblong, 4 to 9 lines long, rather longer than the petiole; raceme dense, in age usually much elongated; petals $1\frac{1}{2}$ lines long; stamens and ovary exserted; pods $1\frac{1}{2}$ to 2 lines broad, the lobes strongly divergent and crested or toothed at apex, the cells separated by a partition with a single rather large perforation; stipe in fruit 2 to 4 lines long; style persistent and bristle-like.

Sacramento to Lathrop and southward in the San Joaquin Valley. Not abundant in the Lower San Joaquin twenty years ago as now (Mrs. K. Brandegee). Grows on the white alkali at Travers and Goshen, but appears only once in two years! Greedily visited by bees when in flower.

40. RESEDACEÆ. MIGNONETTE FAMILY.

Herbs with simple alternate leaves and gland-like stipules. Flowers perfect, irregular, in racemes. Sepals and petals 4 to 7, the latter lacinate. Stamens indefinite, borne on the inside of a fleshy disk, which is enlarged on the upper side. Pistil superior, composed of 3 to 6 carpels, 1-celled, with 3 to 6 parietal placenta, opening at the top before the seeds are full grown. Stigmas 3 to 6, sessile, minute.

1. RESEDA L. MIGNONETTE. DYER'S WEED.

Stamens 8 to 30. Capsule 3 to 6-lobed, horned. (From the Latin *resedo*, to calm, certain species used as a sedative.)

Petals deeply cleft into 5 to 8 spatulate segments; leaves entire

Petals 3-cleft at summit; leaves divided

1. *R. odorata*.

2. *R. alba*.

1. **R. odorata** L. COMMON MIGNONETTE. Stems decumbent or ascending, 4 to 7 in. high; leaves spatulate-oblong, entire; raceme broad and rather open; flowers very fragrant, 2 lines broad, greenish white; anthers large, brick-red.

An escape from the gardens. Spontaneous in Marin Co. Apr.

2. **R. alba** L. WHITE MIGNONETTE. Leaves pinnate or deeply pinnatifid, the segments linear or oblong; raceme dense, spike-like; flowers nearly or quite white, 2 to 3 lines broad.

Native of southern Europe: spontaneous acc. to Greene.

41. VIOLACEÆ. VIOLET FAMILY.

Herbs with alternate leaves and complete flowers. Sepals 5. Corolla irregular, consisting of 5 somewhat unequal petals, the

lowest spurred at base. Stamens 5, with short and broad filaments bearing the anthers on their inner face and connivent over the ovary. Ovary superior, 1-celled, maturing into a 3-valved capsule with valves placenta-bearing along the middle. Seeds rather large, with a hard coat and straight embryo in fleshy endosperm.

1. VIOLA L. VIOLET.

Perennial herbs with foliaceous persistent stipules and 1-flowered axillary peduncles. Sepals unequal, produced below the point of insertion into auricles, persistent. Stamens with broad connectives which are prolonged beyond the anthers, the two lower bearing spurs which project into the spur of the corolla. The valves of the capsule bear the seeds along the middle, and after dehiscence fold together firmly lengthwise and eject the seeds with violence. (Old Latin name used by Virgil.)

Leaves all undivided.

Flowers violet or purple; leaves broadly ovate, truncate or subcordate at base, obtuse at apex: var. *adunca* of. 1. *V. canina*.

Flowers white, or white and yellow and purple; leaves cordate- or triangular-ovate, more or less acute or pointed at apex. 2. *V. ocellata*.

Flowers yellow.

Stems erect, short; leaves often oblong; high montane. 3. *V. purpurea*.

Stems erect, longer; leaves round-ovate with truncate base; low open hills. 4. *V. pedunculata*.

Stems prostrate, stolon-like; leaves round-cordate, rounded at apex, glandular-dotted; Redwood belt. 5. *V. sarmentosa*.

Stems erect, long; leaves reniform-cordate, $1\frac{1}{2}$ to $3\frac{3}{4}$ in. broad; wet woods. 6. *V. glabella*.

Leaves divided; flowers yellow.

Acaulescent; leaves bipinnatifid into narrow segments. 7. *V. Douglasii*.

Caulescent; leaves cleft or divided into few to several lobes. 8. *V. lobata*.

1. *V. canina* L. var. *adunca* Gray. DOG VIOLET. Stems leafy, 2 to 4 in. high; leaves round-ovate to elliptic-ovate, the lower inclining to be subcordate, obscurely crenate, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; stipules more or less herbaceous and lacerate; petals violet, turning to red-purple, 6 lines long or less, the lateral strongly bearded on the upper side at base, the upper pair with a slight tuft in the middle at base; spur much shorter or quite as long.

Hilltops in the vicinity of the coast. Feb.-Apr.

2. *V. ocellata* T. & G. WESTERN HEART'S EASE. Caulescent, the stems erect, 5 to 12 in. high, from creeping rootstocks; leaves cordate- to triangular-ovate, crenate, acute or abruptly acuminate or somewhat pointed at apex, 1 to $2\frac{1}{2}$ in. long, the radical long-, the cauline short-petioled; stipules small and scarious; pedicels mostly shorter than the leaves; petals 5 to 7 lines long; two upper petals white, violet-purple on the outside; the other petals white or yellow, the lateral with a deep purple spot at base, the lower purple-veined at base.

Shady woods, Monterey and the Santa Cruz Mountains to Mendocino Co.; not in the inner Coast Ranges. Mar.-June.

3. *V. purpurea* Kell. MOUNTAIN VIOLET. Plants 3 to 6 in. high; the stems very short and densely tufted, from a stout vertical root, the young herbage hirsutulous-canescens; leaves rhombic-ovate or oblong (1 or 2 frequently nearly round), dentate or crenate or sometimes nearly entire, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, on petioles 1 to 3 in. long; peduncles surpassing the leaves, 2 to 4 in. long; petals yellow, brownish on the outside.

Coast Range peaks and high mountain ridges: Loma Prieta, *Davy*; Mt. Diablo, *Brewer*; Caux's Knob (west of St. Helena), *Jepson*; Howell Mountain (lower petal twice or almost twice as broad as the others, truncate or slightly retuse, standing alone, the other 4 turned upward; lateral petals with a short bearded spot at base; lateral and lower petals with purple lines at base). Mar.-Apr.

4. *V. pedunculata* T. & G. YELLOW PANSY. Short-caulescent, the stem 2 to 6 in. high and ascending, from a thick deep-seated rootstock; leaves round-ovate, usually with truncate base, coarsely crenate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; petioles 1 to 2 in. long; stipules foliaceous, narrowly lanceolate, uppermost often sparingly incised; flowers large, 1 in. broad, on erect peduncles (4 to 5 in. long) much surpassing the leaves; petals golden yellow, the upper petals dark brown on the outside, the others purple-veined within; lateral petals bearded; stigma bearded; ovary and capsule glabrous, the latter broadly oblong, 5 lines long.

Open hills: Vacaville to Berkeley; Leona Heights; Lake Merced; and southward in the Coast Ranges. Middle of Mar.-Apr. In the foothills of the Sacramento Valley frequently known as "Johnny Jump-up."

5. *V. sarmentosa* Dougl. WOOD VIOLET. Stems prostrate, stolon-like, sparsely leafy; peduncles commonly longer than the leaves, at first scape-like and arising from the cluster crowning the stipular-scaly rootstock; stipules brown-scarious, ovate-subulate; leaves round-cordate, $\frac{1}{2}$ to $1\frac{1}{4}$ in. broad, rather shorter than the peduncles, deep green above, often rusty beneath, finely crenate, in age brown-punctate; petioles of the cauline 1 or 2 in. long or less, of the radical 2 to 7 in. long; petals uniform light yellow, 4 lines long; spur very short and broad.

Woods of the Coast Ranges, especially in the Redwood belt; multiplying vegetatively by filiform rootstocks.

6. *V. glabella* Nutt. Stems erect, mostly weak, naked below or nearly so, 7 to 12 in. high; rootstock horizontal, often branching; herbage glabrous or puberulent, bright green; radical leaves reniform-cordate, $1\frac{1}{2}$ to $3\frac{3}{4}$ in. broad, on elongated (4 to 11 in.) petioles, the cauline similar or cordate, on petioles 4 to 5 lines long; stipules small and thin-membranaceous; peduncles about $1\frac{1}{2}$ in. long; petals bright yellow, more or less purple-veined, 6 lines long, the lateral ones bearded; spur short and saccate; stigma beardless; capsule oblong, 4 lines long, abruptly beaked.

Wet places in Coast Range woods: Monterey and northward. Also Sierra Nevada. Mar.-May.

7. **V. Douglasii** Steud. Acaulescent, the cluster of stems subterranean and from a rather deep and short caudex-like rootstock; leaves bipinnatifid with long linear or oblong segments; stipules lanceolate, entire or incised; flowers usually large, on peduncles (2 to 3 in. long) equaling or exceeding the leaves; petals about 6 lines long, orange-yellow, the two upper brownish-purple externally, the others purple-veined; lateral ones beardless; capsule 3 or 4 lines long, acute.—(*V. chrysantha* Hook.)

Open hillsides in the Coast Ranges from Mendocino, Lake, and Solano Cos. southward. Sierra Nevada, Penn Valley, *Jepson*. Modoc Co., *Baker*. Readily recognized by its much dissected leaves.

8. **V. lobata** Benth. PINE VIOLET. Erect, 4 to 14 in. high, the stems naked below; rootstock short, bearing many fleshy-fibrous white roots; leaves 1 to 2 in. long, ovate or almost round in outline, cordate or truncate at base, palmately 3 to 5-cleft or -divided, the lobes entire or somewhat repandly toothed, and the lateral usually larger; inflorescence somewhat umbellate; peduncles 1 to 2 in. long; petals yellow, purple on the outside; valves of the capsule deeply concave-carinate.

Coast Ranges north of San Francisco Bay, often under Yellow Pine: Sonoma, *Brewer*, no. 977; Franz Valley Grade, *Jepson*; Geysers, *McLean*; Howell Mountain (lower petal truncate or more commonly acute, always apiculate; lateral petals bearded at base; lower and lateral petals longitudinally purple-lined at base). Mar.—Apr. Var. **INTEGRIFOLIA** Wats. Leaves of similar outline, crenate or with a few very coarse teeth, but not at all lobed.—Growing with the species on Howell Mountain and otherwise exactly like it in every feature and detail of flower and habit.

42. CISTACEÆ. ROCK-ROSE FAMILY.

Low shrubs or (ours) somewhat suffrutescent plants with complete regular hypogynous flowers. Sepals 5, persistent (2 smaller, wholly on the outside and bract-like). Petals 5, ephemeral. Stamens indefinite. Ovary superior, 1-celled with 3 parietal placentæ; style one; ovules orthotropus on slender funiculi. Capsule 3-valved.

1. HELIANTHEMUM Pers.

Leaves alternate, simple, entire. Petals yellow, opening but once. Stamens usually numerous, with filiform filaments and short anthers. Style very short or none; stigma capitate, 3-lobed. Capsule 1-celled or nearly 3-celled by the intrusion of the placentæ. (Greek helios, sun, and anthemon, blossom.)

1. **H. scoparium** Nutt. Mostly suffrutescent at base, erect, 1 to 2 ft. high, corymbosely much branched, glabrous or nearly so; leaves small, narrowly linear, sometimes very few; sepals minutely pubescent, sometimes glandular, the inner 2 to 3 lines long, the two outer minute and bract-like; corolla 5 to 7 lines in diameter; placentæ septiform; embryo slender and much coiled.

Dry slopes and ridges of the Coast Ranges from Lake Co. to Mt. Tamalpais and southward; not common. Apr.-May. Branches commonly clustered and very rush-like, owing to the sparseness, or to the early deciduous character of the foliage.

43. ELATINACEÆ. WATER-WORT FAMILY.

Small annuals with opposite leaves and membranous stipules between them. Flowers 2 to 5-merous, small, perfect, symmetrical, solitary in the axils. Sepals, petals and stamens all distinct and hypogynous. Ovary with as many cells as there are sepals; styles distinct. Capsule 2 to 5-celled, septicidal or the partitions more or less persisting with the axis; placenta central.

Flowers 2 to 4-merous; sepals obtuse, without midrib 1. ELATINE.
Flowers 5-merous; sepals pointed or acute, with thickened midrib and
scarious margins 2. BERGIA.

1. ELATINE L. WATER-WORT.

Glabrous dwarfs, somewhat succulent, growing in water or in wet places, rooting at the nodes. Leaves entire. Flowers 2 to 4-merous. Sepals submembranous, obtuse. Petals white or whitish. Capsule globose, thin-membranous, 2 to 4-celled, several- or many-seeded. Seeds striately sculptured.

Flowers sessile, mostly 2-merous 1. *E. brachysperma*.
Flowers short-pedicel, mostly 4-merous 2. *E. Californica*.

1. *E. brachysperma* Gray. MUD PURSLANE. Mostly terrestrial, the plants forming little mats (2 or 3 in. across) in wet places or late vernal beds of winter pools; leaves obovate or oblong, narrowed at base, 1 to 2 lines long; flowers sessile, mostly 2-merous; capsule bursting irregularly; seed with 6 to 7 longitudinal lines and 10 to 12 cross-bars.

Walnut Creek and southwestward to the coast. May.

2. *E. Californica* Gray. Leaves obovate or oblanceolate, the lower ones petioled; flowers on short pedicels; sepals and petals 3 or 4, the stamens twice as many; seeds curved, with 10 or 12 longitudinal lines and several cross-lines.

Suisun, acc. to Mrs. K. Brandegee; northern Sierra Nevada.

2. BERGIA L.

Branching annual, very leafy, with pubescent herbage. Flowers pedicel and often fascicled, 5-merous. Sepals pointed or acute, with strong midrib and scarious margins. Capsule ovoid, of firm texture, more or less of the partitions remaining with the axis. (Named for Dr. P. J. Bergius, Swedish naturalist of the 18th century.)

1. *B. Texana* (Hook.) Seubert. Diffusely branched, 6 to 12 in. high; stems glandular-pubescent; leaves obovate or oblanceolate, tapering at base, serrulate at apex, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; sepals 2 lines long, equaling or exceeding the whitish petals; stamens 5 or 10.

Sacramento and San Joaquin Valleys.

44. **HYPERICACEÆ.** ST. JOHN'S WORT FAMILY.

Ours herbs or slightly suffrutescent plants. Leaves opposite, entire, without stipules and with pellucid dots or dark glands. Flowers perfect, regular and hypogynous. Sepals 4 or 5, herbaceous, persistent. Petals 4 or 5, (in ours) yellow. Stamens usually numerous, distinct or more or less united into 3 to 5 clusters. Ovary 1-celled, or more or less completely 3 to 5-celled. Fruit a septicidal capsule. Seed without endosperm.

1. **HYPERICUM** L. ST. JOHN'S WORT.

Leaves sessile. Flowers cymose. Sepals 5, equal. Petals 5, deciduous or marcescent. Styles in ours 3. Capsule conical to globose or oblong. (Ancient Greek name.)

Annuals; sepals longer than the petals; styles short; capsule 1-celled.

Erect from the base, more or less branching; stamens 6 to 12.

Procumbent, forming mats with ascending or erect branches; stamens 15 to 20. 1. *H. mutilum*.
 Perennials; petals much longer than the sepals; styles long; capsule 3-celled; stamens very numerous. 2. *H. anagalloides*.

Herbaceous; stems from rootstocks, simple or branched above: var. *Scouleri* of 3. *H. formosum*.

Suffrutescent; stems branching from the base. 4. *H. concinnum*.

1. *H. mutilum* L. Stem mostly simple below and branching above, 10 to 17 in. high; leaves ovate, 5 to 10 lines long, 3 to 6 lines broad, 5-nerved at base, sessile; flowers in leafy cymes at the ends of the branches; stamens 6 to 12; sepals linear to lanceolate, mostly shorter than the capsule; capsule ovate, $1\frac{1}{2}$ lines long.

Shores of the Sacramento at New Town Landing near Rio Vista. Aug.-Sept.

2. *H. anagalloides* C. & S. FALSE PIMPERNEL. Commonly forming dense mats 6 to 15 in. broad, with ascending or erect branches 2 to 5 in. high; leaves lanceolate to ovate or orbicular, obtuse, 5 to 7-nerved at base, 2 to 6 lines long and almost as broad; flowers in a leafy paniculate cyme, scarcely 2 lines long; sepals ovate or linear-oblong, unequal, longer than the capsules; stamens 15 to 20.

Common about springy places and along streamlets in the mountains: Santa Cruz Mountains; Lake Co.; Sierra Nevada. July-Aug.

3. *H. formosum* HBK. var. *Scouleri* Coulter. Stems from running rootstocks, slender, simple or branching at summit, 2 to 3 ft. high, leaves ovate or oblong, obtuse, conspicuously black-dotted along the margins, sessile by a more or less clasping base, 1 in. long or less; flowers in more or less panicled cymes; sepals and petals black-dotted similarly to the leaves; sepals 2 lines long or less; petals 6 lines long; stamens numerous, in 3 clusters.

Howell Mountain and northward in the Coast Ranges at the highest altitudes, but rare; more common in the Sierra Nevada.

4. *H. concinnum* Benth. Stems wiry, numerous from the woody crown, forming a bushy plant about 1 ft. high; leaves thickish,

lanceolate or linear-oblong, acute, inserted by a narrow base, usually folded, black-dotted as in the preceding but more scantily, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; flowers 1 in. or more broad, in rather close clusters at summit of the stem; sepals ovate, mucronate-acuminate, longer than the capsule; stamens numerous.

Dry bushy mountain slopes and ridges: North Coast Ranges (Vaca Mountains, Knoxville, Howell Mountain, Ukiah); Sierra Nevada. June-Sept.

45. STERCULIACEÆ. STERCULIA FAMILY.

Shrubs or trees with alternate leaves and perfect regular or nearly regular 5-merous flowers. Stamens united at base into a tube. Fruit a capsule.

1. FREMONTIA Torr.

Leaves small, often lobed. Pubescence stellate. Flowers showy, short-pedicled, solitary and axillary on the branchlets. Stipules caducous. Bractlets 3 to 5, small. Calyx yellow and corolla-like, deeply 5-cleft into round-ovate lobes or sepals; these imbricated in the bud, the three inner a little larger, all with a rounded and sharply defined short-hairy glandular area at base. Corolla none. Stamens 5; filaments united to the middle. Style one, elongated, the acute apex stigmatic. Fruit a 4 or 5-celled capsule, loculicidally dehiscent. (In honor of its discoverer, General John C. Fremont, the Pathfinder of the Rocky Mountains and Sierra Nevada, and first United States Senator from California.)

1. *F. Californica* Torr. MOUNTAIN LEATHERWOOD. Loosely branching and bush-like, 6 to 10 ft. high or becoming a small tree as much as 18 ft. high; branches tough and flexible, with many short leaf- and flower-bearing branchlets or spurs; leaves green above, covered beneath with a dense gray or whitish felt, $\frac{1}{4}$ to 1 in. long, or on sterile shoots somewhat larger; petioles short; calyx flannel-like, $1\frac{1}{2}$ to 2 in. broad, persistent, the sepals commonly mucronate; capsule ovate, covered with a dense brown felt and with short bristly hairs, $\frac{3}{4}$ to $1\frac{1}{8}$ in. long, persistent.

Rare in our region: Hunt Valley, Lake Co., *Bolander*; Loma Prieta, Santa Cruz Mountains, *Behr*; near Wright's Station, acc. to K. Brandegee. Abundant in the southern Sierras.

46. MALVACEÆ. MALLOW FAMILY.

Herbs or soft-woody shrubs with mucilaginous juice, tough fibrous inner bark, and usually stellate pubescence. Leaves alternate; simple, palmately veined and commonly lobed, stipulate. Flowers commonly perfect, sometimes polygamous or diœcious, regular. Calyx with 5 lobes, valvate in the bud, often with an involucl of bractlets at base. Petals 5, twisted in the bud. Stamens indefinite, hypogynous, monadelphous in a column or tube around the pistils, the petals inserted on the base of the tube. Pistil 1, composed of several to many carpels,

the ovary commonly with as many cells as styles or stigmas. Fruit a loculicidal capsule, or the carpels separating at maturity.

Anthers scattered along the outside of the tube of filaments; carpels or cells of the ovary 5; fruit a loculicidal capsule. 1. HIBISCUS.

Anthers borne in a cluster at the top of the tube of filaments; carpels several, crowded and united around a central axis, separating at maturity.

Styles stigmatic lengthwise on the inside.

Bractlets united at base into a 2 to 3-lobed involucl, free from the calyx; shrubs. 2. LAVATERA.

Bractlets 3, distinct, inserted on the calyx; herbs 3. MALVA.

Bractlets none, or one and inserted at base of calyx; herbs 4. SIDALCEA.

Styles with terminal stigma; bractlets slender or even filiform.

Flowers roseate, rose-purple or white; mostly shrubs or suffrutescent plants 5. MALVASTRUM.

Flowers cream-color; low decumbent herb 6. SIDA.

1. HIBISCUS L. ROSE-MALLOW.

Stout herbs. Flowers showy, in ours solitary on the subterminal peduncles. Involucel consisting of numerous slender bractlets. Stamen column with anthers scattered along the upper part but naked at the truncate 5-toothed summit. Ovary 5-celled with 2 to many ovules in each cell. Capsule loculicidal. (Greek name for the Marsh Mallow, used by Dioscorides.)

1. *H. Californicus* Kell. Stems pubescent, cane-like, 3 to 7 ft. high; leaves cordate, dentate, acuminate, $2\frac{1}{2}$ to 3 in. long from the summit of petiole to apex of leaf, and about as broad; petioles $1\frac{1}{2}$ or 2 in. long; bractlets and valves of capsule ciliate; peduncles 2 or 3 in. long, jointed near the middle, united with the petiole at base; calyx campanulate, cleft to the middle, conspicuously nerved at maturity and filled by the capsule; corolla white or roseate, with deep crimson center, 3 to 4 in. long; capsule exceeding 1 in. long; seed minutely papillate.

Low marshy places along the Sacramento and San Joaquin Rivers.

2. LAVATERA L.

Ours shrubs with ample maple-like leaves and small caducous stipules. Flowers showy, axillary, subtended by a 2 to 3-lobed involucl. Pedicels jointed above the middle. Calyx with 5 triangular acute lobes. Petals reflexed after anthesis, truncate or retuse, long-clawed. Stamen-column elongated. Styles 5 to 8. Fruit a depressed whorl of smooth carpels. (Two brothers Lavater, Swiss physicians and naturalists.)

1. *L. assurgentiflora* Kell. Branching shrub 4 to 10 ft. high, the herbage canescent or nearly green; leaves palmately 5-lobed and dentately toothed; corolla 2 in. broad, the petals rose-color with darker veins; claws bearded at base; axis of the fruit below the flattened or low conical summit with as many longitudinal wings or ridges as carpels, these inserted in the intervals or depressions.

Region of San Francisco Bay, commonly cultivated and said to be naturalized; flowering at nearly all seasons.

3. **MALVA L. MALLOW.**

Ours annual or biennial weeds of waste places. Involucre of 3 distinct bractlets, inserted on the base of the calyx. Calyx cleft to the middle into 5 broad lobes. Petals whitish or rose-color, obcordate or emarginate. Style-branches 10 or more, subulate. Fruit a depressed whorl of carpels, separating from the central axis when ripe as 1-seeded achene-like nutlets, which are round-reniform and completely filled by the seed. (From the Greek *malache*, soft, on account of the emollient properties.)

Petals much surpassing the calyx.

Carpels not reticulate, puberulent on back 1. *M. rotundifolia*.

Carpels glabrate at maturity, rugose-reticulate on back, the margin entire or obscurely denticulate; calyx-lobes mostly closed over the mature fruit 2. *M. borealis*.

Petals slightly longer than the calyx; carpels rugose-reticulate on back, the margin winged and denticulate; calyx-lobes spreading or erect 3. *M. parviflora*.

1. ***M. rotundifolia* L. DWARF MALLOW.** Sparsely hispidulous or hirsute; stems slender, procumbent, 1 to 2 ft. long, from a large deep root; leaves rounded, crenate, slightly or scarcely at all 5 to 7-lobed; corolla surpassing the calyx, pale blue; carpels 14 or 15, puberulent, not reticulated on the back or at least not obviously so.

Waysides and old gardens at Berkeley. Summer and autumn.

2. ***M. borealis* Wallm. LARGE-FLOWERED MALLOW.** Habit and foliage like the preceding, but herbage often more hairy; pedicels tending to be reflexed in fruit; bractlets ovate or lanceolate; calyx-lobes mostly closed over the mature fruit; corolla pinkish, 5 to 6 lines long, surpassing the calyx; carpels dorsally rugose-reticulate or even somewhat favose, the margin entire or obscurely denticulate.

Common at Berkeley and other Bay towns, flowering during the summer into early winter.

3. ***M. parviflora* L. SMALL-FLOWERED MALLOW.** Widely branching, 1½ to 3 ft. high; petioles and ascending branches stellate-hairy on the upper side, glabrous below; leaves roundish in outline, with a red spot at base of blade, shallowly 7-lobed, 5 in. broad or less, on petioles twice as long as the blade; flowers in rather close axillary clusters; bractlets linear; corolla pinkish with notched petals, 2½ lines long, slightly longer than the calyx; calyx commonly spreading under or about the mature fruit; carpels about 11, glabrous, sharply rugose-reticulate and pubescent on the back, the margin winged and denticulate.

Very common in waste places, especially near dwellings in the interior valleys; flowering in spring and early summer. All of our species are naturalized and all called "Cheeses" by children on account of the peculiar fruit.

4. **SIDALCEA Gray.**

Herbs. Leaves rounded and either crenate, crenately incised, parted or divided, or palmately lobed. Flowers in terminal spikes or racemes, either perfect, gynodioecious (*i. e.*, with perfect and pistillate

flowers on separate plants, the pistillate flowers being smaller) or diœcious. Corolla purple, rose-pink or white. Bractlets in ours none, rarely 1. Petals emarginate or truncate. Stamen-tube double, the terminal free portion of the filaments of the outer series often distinctly below the filaments of the inner series; free portion of filaments (*i. e.*, the terminal portion, or portion above the tube) more or less united into sets. Fruit consisting of 5 to 9 carpels, commonly beaked. (*Sida*, a genus of this family, and *Alkea*, ancient name for a mallow, alluding to the appearance and relationship of these plants.)

Leaves round in outline, at least some (usually the upper) pedately parted or divided; flowers in ours rose-pink or purple.—EUSIDALCEA.

Petals truncate or merely retuse; annuals except no. 4.

Carpels rugose-reticulate on back and

Beakless; pubescence both stellate and hispid-pilose, especially on calyx; bracts foliaceous, palmately divided into filiform segments

1. *S. diploscypha*.

Tipped with a soft and hairy, at length deciduous beak; flowers minutely bracteate; herbage mainly stellate-pubescent.

2. *S. Hartwegi*.

Carpels longitudinally grooved or striate-nerved on back.

Slender annual; stipules 1 to 2 lines long 3. *S. sulcata*.

Stout perennial; stipules 3 to 6 lines long 4. *S. calycosa*.

Petals deeply emarginate; perennials.

Raceme mostly loose, terminating a simple stem; flowers gynodiœcious; carpels slightly rugulose-reticulate. 5. *S. malvæflora*.

Stem commonly branching, the terminal spikes dense; flowers perfect; achenes smooth on back 6. *S. Oregana*.

Leaves vitiform, angulately 5 to 7-lobed, none parted or divided; flowers white; perennial.—HESPERALCEA.

Flowers diœcious or subdiœcious; spikes short and dense, panicked; carpels smooth 7. *S. malachroides*.

1. *S. diploscypha* (T. & G.) Gray. Annual, erect and simple, or more robust and branching, 7 to 20 in. high, pilose-hispid, and also with a minute stellate pubescence; radical leaves more or less deeply crenate, the cauline parted and 2 to 3-cleft, the bracteal filiform divided; flowers on short pedicels in umbellate clusters at the ends of the branches; calyx-lobes lanceolate-subulate; petals nearly 1 to 1½ in. long, minutely erose-denticulate; filaments of the outer series united nearly to the summit into sets of 5 to 10; carpels nearly orbicular, dorsally reticulated; receptacle at separation of the achenes marked by as many obtuse longitudinal processes as there are carpels.

Open fields or low hills: Sacramento Valley; Coast Range valleys from Humboldt and Sonoma Cos. southward to Mt. Diablo and Newark, Alameda Co. May.

Var. *minor* Gray (*S. secundiflora* Greene). Flowers tending to be disposed in lax spicate racemes; corolla with a dark purple center, about ¾ in. long; carpels rugose.—Montezuma Hills (Solano Co.) and northward in the Sacramento Valley.

2. *S. Hartwegi* Gray. Slender annual, sparingly branched, about 1 ft. high, sparsely stellate-pubescent or almost glabrous below, but scarcely or not at all hispid; leaves pedately 5 to 7-divided into linear entire divisions or the lower with broader trifid divisions; flowers few in a short spike; filaments of the outer series closely approximating the inner, more or less united in pairs or sets as in the perennial

species; corolla rose-purple, 6 to 8 lines long; carpels strongly incurved, favosely rugose-reticulated.

Sierra Foothills: Butte Co. to Calaveras Co. (and Mariposa Co. acc. to Syn. Fl.). Coast Ranges: hills west of Rutherford, Napa Valley. May.

3. *S. sulcata* Curran. Annual, slender, unbranched, or sparingly branched, 11 to 14 in. high; leaves small (mostly $\frac{3}{4}$ in. long or less), the lower crenate, the upper divided into about 6 often narrowly linear divisions; stipules 1 to 2 lines long; raceme spike-like or loose, few-flowered; calyx purplish, sparingly hairy; sepals narrowly ovate, acuminate; corolla 8 or 9 lines long.

Petaluma, *J. W. Congdon*; northern Sierra Foothills. May-June.

4. *S. calycosa* M. E. Jones. Perennial; rootstocks creeping, branched; stems green or purplish, very succulent, decumbent and rooting freely below, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; herbage glabrous below or sparingly hirsute above; radical leaves 3 to 4 in. broad, crenately but shallowly incised; cauline leaves divided into about 8 or 9 broadly cuneate divisions; stipules round or ovate, acuminate, or obtuse and toothed, green or purple, 3 to 6 lines long; flowers in terminal short spikes; calyx rather densely covered with sandy-brown hairs, its lobes ovate, acuminate, 3 to 6 lines long; corolla 1 in. long, lilac; carpels grooved in the back or with the grooves sparingly interrupted transversely, minutely reticulate on the sides, the slender beak weak but persistent.

Point Reyes; Sonoma Co. acc. to Syn. Fl.; rarely collected.

5. *S. malvæflora* (Moc. & Sesse) Gray. Stems erect (half-decumbent at the very base), $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, several from a woody perennial root, simple or rarely branched, retrorsely-hispid below with scattered hairs, above slightly stellate-pubescent; basal leaves crenate or crenately incised or cleft into cuneate-obovate 2 to 4-toothed lobes; upper leaves palmately twice cleft into linear or narrowly oblong divisions; raceme rather loose, 3 or 4 in. to 1 ft. long; bracts ovate, herbaceous, often notched at apex; flowers of two sorts:—one perfect with large corollas, the other pistillate with small corollas; corolla of perfect flowers 8 to 12 lines long, the outer series of filaments united for about half their length into sets of 4 or 2, the inner filaments mostly distinct; corolla of pistillate flowers 5 to 7 lines long, the filaments destitute of anthers; carpels rugulose-reticulate, at least on the sides.—(*S. delphinifolia* Nutt. and *S. humilis* Gray.)

High places of open fields in the valleys and on the plains, or in a reduced form on hilltops. Last of Apr.—May. First collected by Mocino, doubtless at Monterey as suggested by Gray. Sometimes known to school-children as "Wild Hollyhock," or in Calaveras Co. as "Wild Checker-bloom."

6. *S. Oregana* (Nutt.) Gray. Stems few from a stout thick root or woody crown, erect, $1\frac{3}{4}$ to $3\frac{1}{4}$ ft. high, nearly naked above, and either simple or paniculately branched; leaves round in outline, shallowly cleft or toothed, the lobes obtuse; cauline leaves incisely parted with

the lobes toothed or cleft, or the uppermost pedately divided into 5 to 7 lanceolate or linear mostly entire divisions; spikes dense, oblong, 1 to 2 in. long, long-peduncled; bracts narrowly linear or subulate; calyx-lobes ovate, acute, about as long as the tube; corolla rose-pink, 5 or 6 lines long; carpels semi-orbicular, slightly beaked, 1 line long, glabrous and smooth, or slightly wrinkled on the sides near the dorsal angle.

High mountains of Sonoma and Napa Cos. northward to Mt. Shasta. July–Sept.

7. *S. malachroides* Gray. Herbage stellate-hispidulous; stems stout, equably leafy to the summit, several from a perennial root, simple below, ending above in a panicle of white flowers in short dense spikes, or the panicle supplemented by some very slender peduncle-like branches from the upper axils, each terminated by a spike; leaves palmately but shallowly lobed, unequally dentate, 1 to 6 (mostly 2 to 3) in. broad; petioles of the basal leaves 6 in. long, decreasing upward, those of the uppermost leaves shorter than the blade; bracts linear or subulate; calyx lobes ovate, acuminate; filaments of the outer series united for about $\frac{1}{2}$ their length or less into pairs, or two such pairs slightly united by their bases making a set of 4; carpels sometimes present but probably abortive; pistillate flowers 3 to $3\frac{1}{2}$ lines long, the tube of filaments short, more or less truncate and without anthers; carpels 7 to 9, half dehiscent by a dorsal suture.

Seaboard species from the Santa Lucia Mountains and Santa Cruz northward to Crescent City, here described from abundant specimens collected on Englewood Prairie, under *Pinus ponderosa*, Humboldt Co., by Mr. J. B. Davy, June, 1899. This is the type of Greene's genus *Hesperalcea*, which rests mainly on the character of the cotyledons, which are ovate and not cordate as in *S. malvæflora*. *S. malachroides* is, however, very like the California type of *S. Oregana* in the form of its spikes and bractlets, and repeats in very many features the structure and character of the gyno-dioecious flowers of *S. malvæflora*. The leaves are peculiar in that none of them are divided; but the lower ones (which are often small, round and scarcely lobed) approach the lower leaves of the true *Sidalceas*.

5. **MALVASTRUM** Gray. FALSE MALLOW.

Herbs or shrubs, ours mostly hoary-tomentose or canescent, with commonly angular leaves. Flowers solitary or more commonly in narrow subpaniculate racemes. Bractlets present (in ours), slender and filiform. Carpels 5 or more, 1 to 3-seeded, the fruit often dehiscent and 2-valved. Seed ascending. (*Malva*, Mallow, and aster, disparaging Latin suffix, not genuine or true.)

Flowers solitary on long slender peduncles; petals rose-color; annual . . .

1. *M. exile*.

Flowers in subpaniculate racemes; petals yellow; perennials.

Herbage densely stellate-tomentose.

Leaves pentagonal or roundish; petals rose-color; suffrutescent

2. *M. Fremonti*.

Leaves ovate; petals yellow; shrub

3. *M. arcuatum*.

Herbage finely stellate-canescant; petals rose-color; shrub

4. *M. fasciculatum*.

1. *M. exile* Gray. Herbage with a short stellate pubescence, and often with some longer spreading hairs; stems branching from the base, diffuse or decumbent, 4 or 5 in. to $1\frac{1}{2}$ ft. long; leaves palmately 3- to 5-cleft, the lobes commonly laciniately toothed; flowers of different plants of two intergrading sorts, one chiefly pistillate with small white or rose-colored corollas (3 to 5 lines long), the other perfect and with much larger rose-colored corollas (6 to 10 lines long); calyx with an involucre of 3 slender bractlets; calyx-lobes ovate, very slenderly acuminate or even subulate; carpels strongly rugose.

From the San Joaquin Valley (Merced plains, Bakersfield and Buena Vista Hills), westward to Monterey Co. and southward to Southern California; not recorded as within our limits. Apr.—June. The description of the partly gyno-dioecious flowers is taken from Dr. Robinson's clear characterization in the Synoptical Flora. *M. Parryi* Greene from Monterey Co. and the San Joaquin Valley is determined by the same authority to be the perfect-flowered form with large corollas.

2. *M. Fremonti* Torr. Woody at base, stout, 2 to 3 ft. high, densely white-tomentose; leaves very thick, round-ovate, shallowly 5 to 7-lobed, crenate, 2 to 4 in. broad, on petioles $\frac{1}{2}$ to 1 in. long; flower-clusters sessile in the axils or short-peduncled, interrupted-spicate at summit of stem; calyx ovate, densely and closely woolly, only the tips of the lobes visible, almost equaled by the 3 linear-setaceous bractlets of the involucre; corolla rose-color, 7 or 8 lines long; carpels thin, smooth, promptly deliscent.

Mt. Diablo; Corral Hollow ("flowers fragrant like roses," *Brewer*); southward through the Mt. Diablo Range to San Bernardino Co. June. Var. *CERCOPHORUM* Robinson. Calyx 7 to 9 lines long, its lobes lance-linear and caudate-attenuate, nearly or quite equaling the petals.—Arroyo del Valle, Alameda Co., *Greene*. June.

3. *M. arcuatum* (Greene) Robinson. Shrub 6 to 8 ft. high, with virgate terete branches covered with a dense or felt-like white tomentum; leaves ovate to ovate-orbicular, little or not at all lobed, truncate at base, more or less rugose, canescent-tomentose beneath, becoming green above, dentately toothed, $\frac{3}{4}$ to 2 in. long, on petioles $\frac{1}{2}$ to $\frac{3}{4}$ as long; flower-clusters sessile in the upper axils and at the ends of the branches, forming long interrupted unilateral spikes; bractlets linear-filiform, equaling the tomentose calyx; petals rose-color, 7 to 9 lines long.—(*Malveopsis arcuata* Greene.)

San Mateo Co., first collected by Greene on stream banks back of Belmont; Crystal Springs, *Eastwood*, May, 1896; Los Gatos and foothills near Evergreen (east side of the Santa Clara Valley), acc. to Davy.

4. *M. fasciculatum* (Nutt.) Greene. Shrub 5 to 10 ft. high, with long slender wand-like branches; pubescence short and close; leaves round-ovate, irregularly or obscurely lobed, crenate, mostly truncate or subcordate at base; flowers in sessile or short peduncled clusters, which are loosely paniculate or disposed on short branches in a very

narrow panicle; calyx-lobes ovate, obtuse or with a very short point; petals rose-purple, 5 to 9 lines long; carpels smooth, promptly dehiscent.

Dry inner South Coast Range hills: Mt. Diablo, acc. to Greene; Pacheco Pass, *Bolander*, and southward to San Bernardino Co. June-July.

6. *SIDA* L.

Ours low yellowish scurfy-tomentose perennial herbs. Pedicels articulated. Involucel of 1 to 3 slender deciduous bractlets. Flowers cream-color. Carpels 1-seeded, indehiscent or 2-valved. Seeds pendulous. (Greek name used by Theophrastus for a species of Water-lily.)

1. *S. hederacea* (Dougl.) Torr. Stems from deep-seated tap-roots, decumbent, more or less branching, $\frac{1}{2}$ to 1 ft. long; leaves round-reniform or ovate, dentate or serrate, $\frac{3}{4}$ to 2 in. broad, on petioles $\frac{1}{2}$ to 1 in. long; flowers pediceled, axillary, solitary or in small clusters; calyx-lobes acuminate; petals $\frac{1}{2}$ in. long; carpels 6 to 10, triangular, attached by a straight edge to the slender axis.

Abundant in subsaline soils throughout the Sacramento, San Joaquin, and South Coast Range valleys. May-Sept.

47. LINACEÆ. FLAX FAMILY.

Annual or perennial herbs. Leaves alternate, or sometimes opposite, small, entire, without stipules or these sometimes replaced by a gland. Flowers mostly in cymose panicles, perfect, regular, in ours 5-merous. Petals distinct, very quickly falling. Stamens slightly united at base. Styles 2 to 5, distinct. Cells of the superior ovary as many as the styles, or twice as many by the formation of a false division wall from the back of each cell. False partitions frequently not complete. Fruit a capsule, splitting through the false partitions and frequently also septical.

1. *LINUM* L. FLAX.

Our only genus. (Ancient Latin name of these plants.)

Perennial; styles 5; flowers blue; petals without ventral appendages . .

1. *L. Lewisii*.

Annual; styles 3; petals commonly with appendages.

Leaves closely margined with stipitate glands; pedicels long, solitary . .

2. *L. adenophyllum*.

Leaves entire.

Pedicels elongated and flowers mostly solitary; stem diffusely paniculate above.

Flowers about 3 lines long, on straight pedicels . . 3. *L. spergulinum*.

Flowers about 2 lines long, on nodding pedicels . . 4. *L. micranthum*.

Pedicels short and flowers in rather close clusters.

Flowers white, pink or rose-purple.

Stem paniculately branched; sepals glabrous . . 5. *L. Californicum*.

Stem shortly branched at top; sepals pubescent . . 6. *L. congestum*.

Flowers yellow 7. *L. Breweri*.

1. *L. Lewisii* Pursh. BLUE FLAX. Herbage glabrous; stems several from a woody crown, erect, thickly clothed with leaves, simple below the corymbosely branched summit; leaves linear-

lanceolate or linear, acute, 5 to 9 lines long; flowers in terminal loose and somewhat corymbose clusters, or racemose on the branches; corolla blue, 6 to 9 lines in diameter; pedicels $\frac{1}{2}$ in. long or more; sepals ovate, 3 to 5-nerved; capsule globose, acute, 4 or 5 lines long, eventually dehiscent by 10 valves, the valves often with a brown midnerve.

Upper Salinas Valley, *Brewer*, and northward in the Coast Ranges but rare; more common in the Sierra Nevada.

2. *L. adenophyllum* Gray. Stem 11 to 14 in. high, unbranched below, repeatedly forked above and forming a widely branched panicle; leaves alternate or the lowest opposite, lanceolate, $\frac{1}{2}$ in. long or less, the margin conspicuously glandular-ciliate; flowers yellow or yellowish white, about 2 lines long, on very slender pedicels 1 to 5 lines long; appendages of the petals broad and confluent, somewhat pubescent; filaments abruptly dilated and 2-toothed at base; capsule as long as the lanceolate sepals.

Lake and Mendocino Cos.; to be expected in northeastern Napa Co.

3. *L. spergulinum* Gray. Stems more or less dichotomously paniculate, 11 to 18 in. high; leaves linear; pedicels filiform, rigid, straight, 3 to 10 lines long; flowers pinkish white, 3 to 3 $\frac{1}{2}$ lines long; sepals ovate, nearly 1 line long; petals 2-toothed, with 3 appendages, the middle one ligulate and the lateral often reduced; capsule ovoid, acute, nearly twice as long as the sepals.

North Coast Ranges: Lake and Mendocino Cos.; credited to Marin and Sonoma Cos. by Greene.

4. *L. micranthum* Gray. Five to 10 in. high, freely branched above the base but the branches commonly rather closely ascending, somewhat soft pubescent toward the base; leaves linear-oblong, obtuse, 3 to 6 lines long; flowers commonly 2 lines long, somewhat nodding on filiform pedicels; fruiting pedicels 2 to 4 lines long; sepals oblong-lanceolate, the inner sparingly glandular-ciliate; petals commonly 1, rarely 2 $\frac{1}{2}$ lines long, 2-toothed, mostly without appendages; capsule ovoid, equal to the sepals.

Sierra Nevada; credited to the Bay Region by Trelease.

5. *L. Californicum* Benth. Glabrous and glaucous plants, 10 in. to 2 ft. high, paniculately branched, with angled or striate branches; leaves linear, 5 to 12 lines long, with prominent stipular glands; flowers white or pinkish; sepals lanceolate, with sparingly glandular-ciliate inner margins; petals 2 to 3 lines long, 3-appendaged, the median appendage rounded and hairy; capsule ovoid, acute, a little shorter than the sepals.

North Coast Ranges: Zem Zem, Napa Co. Credited to the Mt. Diablo Region by Greene.

6. *L. congestum* Gray. Eight to 18 in. high, corymbosely branched at top; leaves somewhat pubescent, 4 to 13 lines long, with stipular glands; flowers rose-purple, 3 to 4 lines long, terminating the branches in clusters; sepals pubescent; petals with 3 appendages, the

middle one elongated and hairy; capsule short-ovoid, nearly as long as the calyx.

Marin Co.

7. **L. Breweri** Gray. Glabrous and glaucous; stems 9 to 14 in. high, with a few short branches at the top; leaves narrowly linear, 5 to 8 lines long; flowers yellow, 3 lines long; sepals ovate, some slightly glandular on the margin; petals obovate, not emarginate, more than 2 times as long, 3-appendaged at base.

Dry hill or cañon sides: Mt. Diablo; Vaca Mountains. June.

48. GERANIACEÆ. GERANIUM FAMILY.

Ours herbs with perfect and generally symmetrical flowers. Sepals and petals 3 or 5, the stamens as many or twice as many. Glands of the receptacle as many as the sepals and usually opposite them. Lobes or cells of the superior ovary as many as the sepals, the cells 1 to few-ovuled, the axis of the fruit persisting.

Leaves 3-foliolate, alternate; fruit a capsule. 1. **OXALIS**.

Leaves not 3-foliolate; fruit consisting of achene-like carpels which separate at maturity from a central axis.

Stipules scarious; at least the lower leaves opposite; carpels separating from an elongated central beak or axis and tailed by the persistent coiled or twisted styles.

Stamens with anthers 10; leaves palmately parted 2. **GERANIUM**.

Stamens with anthers 5; leaves pinnatifid or pinnate, or roundish-cordate 3. **ERODIUM**.

Stipules none; carpels subglobose, rugose, separating from a very short axis, not tailed; leaves pinnately cleft. 4. **FLÖRKEA**.

1. **OXALIS** L. WOOD SORREL.

Herbs with acid juice and radical or alternate compound exstipulate leaves. Leaflets usually 3, obcordate, closing and drooping at night. Peduncles axillary, cymosely or umbellately few to many-flowered. Flowers regular, 5-merous. Sepals imbricated. Stamens 10, the filaments somewhat dilated and united at base. Glands none. Capsule oblong, membranaceous, 5-celled, more or less 5-lobed, the cells opening on the dorsal sutures through which the seeds are ejected, the valves remaining attached to the axis by the partitions. Seeds 2 to several in each cell. (Derived from the Greek *oxus*, sour, the juice containing oxalic acid.)

Caulescent; flowers yellow 1. *O. corniculata*.

Acaulescent; flowers pink, white or rose-color 2. *O. Oregona*.

1. **O. corniculata** L. **YELLOW SORREL**. Perennial by running rootstocks, vilous-pubescent; stems herbaceous, slender, decumbent or ascending, 3 to 6 in. long; leaflets mostly obcordate, $1\frac{1}{4}$ in. long, on slender petioles with small villous stipules; peduncles axillary, elongated, bearing two or more flowers; petals yellow; capsule erect in fruit, linear, $\frac{1}{2}$ in. long, many-seeded.

Behaving in the Bay Region after the manner of an introduced plant; flowering through the spring, summer and autumn. Trelease in Gray's Syn. Fl. i. 1. 365, credits *O. Wrightii* Gray to "Central

California; it is a nearly related species with the leafy branches from a stout erect woody caudex.

2. *O. Oregana* Nutt. REDWOOD SORREL. Acaulescent, more or less rusty-villous; leaflets broadly obcordate, broader than long, 1 to 1½ in. long; scapes from creeping rootstocks equaling or exceeding the leaves, 2-bracted near the top, commonly 1-flowered; petals oblong-obovate, 9 to 12 lines long, pink, white, or rose-color, often veined with purple; capsule linear, 9 lines long; cells about 6-seeded.

Shady woods in the Redwood Region from Santa Cruz northward. Mar.-Apr.

2. GERANIUM L. CRANESBILL.

Herbs (ours annual) with forking stems, swollen nodes and stipulate palmately parted leaves. Peduncles axillary, umbellately 2 to 3-flowered, or 1-flowered. Flowers regular, 5-merous, the sepals imbricate in the bud. Stamens 10, sometimes slightly connate at base, all with perfect anthers, the 5 longer alternate with the petals and with glands at their base. Carpel's 5, 2-ovuled, 1-seeded; styles united around a central elongated axis (prolongation of the receptacle), separating elastically from it when mature, and forming a coil which is the "tail" of the carpel and is nearly glabrous inside. Cotyledons plicate, incumbent on the radicle. (Greek *geranos*, a crane, from the elongated fruit-bearing beak.)

Flowers light pink 1. *G. Carolinianum*.
Flowers purple 2. *G. dissectum*.

1. *G. Carolinianum* L. CAROLINA GERANIUM. Hirsute-pubescent and often somewhat glandular; smaller plants erect, the larger ascending or decumbent, 7 to 14 in. high; leaves palmately 5 to 7-parted, the cuneate segments more or less incisely dissected or toothed, the ultimate segments rather broad; peduncles commonly shorter than the petioles; flowers about 3 lines long; petals light pink; beak of fruit loosely villous or glandular; carpels hairy, usually black; seed reticulately ridged or pitted.

Naturalized plant, at one time more common in the Bay Region than now. Mar.-Apr.

2. *G. dissectum* L. COMMON GERANIUM. Differing little from the last, but the primary lobes of the leaves very narrow, with the ultimate divisions mostly slender, somewhat falcate, and acute; petals rose-purple.

An Old World species naturalized in California not many years since and recently became more common than the preceding.

G. pilosum Forst, of Australia and New Zealand, adventive at Alameda and San Francisco, is a similar species but is perennial by a thick rootstock and retrorsely canescent-pubescent but not glandular. *G. parviflorum* Willd., collected at Mt. Tamalpais and Duncan's Mills, has few points of difference with the preceding or with *G. dissectum*. *G. molle* L. has glabrous carpels, conspicuously wrinkled transversely, and unpitted seeds; reported as occurring at San Francisco and at Olema.

3. *ERODIUM* L'Her. STORKSBILL.

Annual herbs. Leaves opposite, often unequal, either simple or pinnate, with one interpetiolar stipule on one side and two on the other. In vegetative characters very similar to *Geranium*; the flower and fruit nearly the same, but the stamens with anthers 5 only, the alternate filaments sterile and scale-like. Styles in fruit twisting spirally, bearded inside. Pedicels after anthesis commonly retro-curved. (Greek *erodios*, a heron.)

Leaves reniform-cordate, lobes (if any) shallow. 1. *E. macrophyllum*.
Leaves oblong to oblong-ovate, pinnatifid or pinnate.

Leaves pinnatifid; sepals bristle-tipped. 2. *E. Botrys*.

Leaves pinnate with serrate or merely incised leaflets; petals with naked claw; sepals not terminated by bristles. 3. *E. moschatum*.

Leaves pinnate with pinnatifid leaflets; claw of petals ciliate; sepals with 1 or 2 terminal bristle-like hairs. 4. *E. cicutarium*.

1. *E. macrophyllum* H. & A. Acaulescent or subacaulescent, tomentose, with interspersed spreading glandular hairs; leaves reniform-cordate, crenate and often with shallow crenate lobes, 1 to 1½ in. broad; umbels mostly 2 to 3-flowered, on elongated (4 to 9 in.) peduncles; petals white, 5 to 8 lines long, little exceeding the broad sepals; filaments conspicuously orbicular-dilated at base; beak of fruit stout; mature carpels densely silky-hairy, truncate at top, 4 lines long.

Willows, *Jepson*; Anderson Valley, *Bolander*, no. 4805; Kirker Pass, *Brewer*; Stockton, *Fitch*; Tracy, *Bioletti*, and southward. Whole leaf blade sometimes undulate and with closed sinus.

Var. *Californicum* (*E. Californicum* Greene). Tall and branching, puberulent and beset with purple-tipped glandular hairs; leaves larger, 2 in. broad; flowers frequently about 5 or 6 in a cluster; petals deep rose-red or purple.—Oakland Hills, *Blasdale*.

2. *E. Botrys* Bertol. Caulescent, branching from the base and commonly prostrate; coarsely white-pubescent, leaves 1 to 2 in. long on petioles as long or twice as long, oblong-ovate, pinnatifid, the lobes serrate, acute; sepals short-pointed and tipped with 1 or 2 short bristles; petals deep violet; glands greenish; filaments dilated nearly to apex and toothed.

Naturalized plant, scarcely known in California ten years ago, but within that time become common in many localities from Marin and Solano Cos. to northern California, spreading with especial rapidity over low pastured hills and rolling gravelly plains.

3. *E. moschatum* L'Her. FILAREE. MUSK CLOVER. Hirsute with scattered spreading hairs, at first acaulescent, the radical leaves often forming a close rosette upon the ground; later with stout fleshy ascending stems ½ to 1 ft. high; leaves 2 or 3 in. to 1½ ft. long; leaflets ovate to elliptical, serrate and sparsely incised, short-petiolate, ¾ to 1½ in. long, the terminal cuneately 3 to 5-parted; stipules large, membranaceous; peduncles in the axil of the smaller of the unequal opposite leaves, much elongated in fruit, 4 to 11 in. long; sepals not bristle-bearing at tip; petals rose-purple, 3 lines long, with short claws; beak of the fruit 1½ to 1¾ in. long; filaments membranously winged at base, with upwardly pointing teeth.

Abundant in rich lands of valley orchards and vineyards. Mar.-Apr. Glands of the flowers reddish or brownish as in the next. The term *Filaree*, a contraction of the Spanish *Alfilerilla* is, like the names *Pin Clover* or *Pin Grass*, indifferently applied to either this species or the next.

4. *E. cicutarium* (L.) L'Her. RED-STEMMED FILAREE. Habit of the preceding; leaflets subsessile, nearly oblong, incisely pinnatifid with acute, often toothed lobes; stipules small, acute; flowers and fruit as in the last, but the sepals terminated by 1 or 2 bristle-like hairs and the filaments little dilated at base, not toothed.

Hillsides or barren or dry soil everywhere. Very common, beginning to flower in Feb. or Mar., usually some weeks in advance of the last, and in many places continuing through the summer. It is an esteemed forage plant. Stems commonly reddish, in the last preceding commonly with white stems.

4. FLÖRKEA Willd.

Low slightly succulent annuals. Leaves alternate, pinnately cleft, exstipulate. Flowers solitary, on axillary peduncles, ours 5-merous, or exceptionally 4-merous. Sepals valvate in the bud, as many hypogynous glands alternating with them. Stamens 10, distinct. Carpels subglobose, nearly distinct, but with a common style which is gynobasic, *i. e.*, arising from among them near the base, and 5-cleft at apex. The fruit consists of roughish carpels separating from the short axis. (Dedicated to Flörke, a German botanist.)

1. *F. Douglasii* Baill. MEADOW FOAM. Glabrous, the stems and foliage yellowish green and succulent, branching at the base and very spreading, the branches 6 to 14 in. long; leaves pinnately divided; divisions 3 to mostly 9 and incisely lobed or parted, the lobes linear, acute; peduncles at length 2 to 4 in. long; sepals lanceolate, 3 to 4 lines long, $\frac{1}{2}$ the length of the petals; petals yellowish, white (or occasionally roseate) at tip, obovate-cuneate; nutlets smooth to strongly tuberculate, about 2 lines in diameter.

Low ground, in or near shallow water, forming large patches which color, in Apr., the valley levels in the Coast Ranges.

49. POLYGALACEÆ. POLYGALA FAMILY.

Ours perennial herbs or somewhat suffrutescent plants with alternate simple leaves and no stipules. Flowers in terminal racemes, irregular and resembling the papilionaceous flowers of *Leguminosæ*, but not like them in structure. Stamens (in ours) monadelphous. Ovary simple, superior.

1. POLYGALA L. MILKWORT.

Stems often with milky juice. Sepals 5, thin, the two lower and the upper keeled one of about the same size, the two lateral much larger, colored, and projecting like the wings of a pea-flower. Petals 3, united at base; middle petal hooded above and often beaked or

crested, enclosing the stamens and style. Stamens 8, monadelphous, the tube open on one side and adnate to the base of the petals. Ovary 2-celled with one ovule in each cell; style long, curved. Capsule with thin walls, flattened contrary to the partition, rounded and often notched above, dehiscing loculicidally at the margin. Seeds with a conspicuous caruncle. (Polus, much, and gala, milk, an ancient Greek name for some shrub used as a stimulant.)

1. **P. Californica** Nutt. Stems many from the branching crown of a cord-like deeply descending perennial root, mostly simple, 3 to 8 in. high; leaves oblong- or elliptic-ovate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, distinctly petioled; flowers of two sorts:—those near the root apetalous and developing most of the fruit; those of the terminal racemes with rose-purple corolla 5 or 6 lines long, the petals more or less pubescent, at least inside or on the margin, the sepals glabrous, with the shorter ones 2 to 3 lines long; capsule broadly elliptical, glabrous, 3 lines long; caruncle of the seed wrinkled and bladdery.

Wooded or brush-covered slopes in the mountains from Ukiah, Howell Mountain, and Marin Co. southward to Santa Barbara. Not reported from the inner Coast Ranges. May.

P. cornuta Kell. of the Sierra Nevada, may be distinguished by its greenish white flowers and densely tomentose sepals.

50. RUTACEÆ. RUE FAMILY.

Herbaceous or arboreal plants, ours shrubs or small trees, with glandular-dotted or aromatic leaves and no stipules. Flowers regular and symmetrical, or nearly symmetrical. Sepals and petals 4 or 5. Stamens as many or twice as many, inserted outside of a hypogynous disk encircling the base of the ovary.

1. PTELEA L.

Shrubs or small trees. Leaves pinnately trifoliate, with sessile leaflets. Flowers small, greenish white, in axillary paniculate cymes. Flowers polygamous. Sepals, petals, and stamens 4 or 5. Ovary with a short thick stipe, 2-celled; cells 2-ovuled, the lower ovule abortive; style short; stigmas 2. Fruit a 2-celled 2-seeded samara, winged all around, broadly orbicular. Seeds oblong. (Greek name of the Elm, the fruit of which is very similar.)

1. **P. Baldwinii** T. & G. var. **crenulata**. HOP TREE. Small tree 8 to 15 ft. high; glabrous or with a slight pubescence on the inflorescence and under surface of the leaves; leaves elliptic, obovate or elongated-rhomboidal, rounded or acute at apex, often with abruptly cuneate base, crenulate or almost entire, 1 to $2\frac{3}{4}$ in. long; buds downy; sepals very small; petals $2\frac{1}{2}$ lines long; stamens hairy towards the base; fruit 5 to 6 lines long, a trifle broader, tipped by the persistent style.—(*P. crenulata* Greene.)

Coast Ranges, not infrequent in certain localities, but probably of restricted range: Mt. Diablo, abundant in Mitchell Cañon, the wing emarginate at apex; Antioch, the wing abruptly acuminate at apex;

Edwards' Cañon near Crockett; Lake Co. The shrub of the Sierra Foothills is doubtless the same species. Apr.-May. Fruit maturing in June, occasionally triquetrous and 3-seeded.

51. ANACARDIACEÆ. SUMACH FAMILY.

Trees or shrubs with resinous or milky acrid juice. Leaves alternate, usually compound, without stipules. Flowers regular, perfect or polygamous. Calyx and corolla 5-merous, the stamens as many or twice as many as the petals. Pistil 1, ovary free from the calyx, 1-celled, 1-ovuled, styles or stigmas 3. A glandular ring or cup-like disk lines the base of the calyx. An order containing the Poison Sumachs and also many tropical trees of economic importance.

1. RHUS L. SUMACH.

Ours deciduous shrubs with 3 (sometimes 5)-foliolate leaves and very small flowers. Sepals and petals usually 5. Stamens inserted under the edge of a perigynous disk which is quite free from the ovary. Styles 3. Fruit a small compressed drupe with thin flesh and bony stone. Seed erect; endosperm none. (Ancient name.)

Flowers greenish, in small panicles; drupe white 1. *R. diversiloba*.
Flowers yellow, in dense spikes; drupe red 2. *R. trilobata*.

1. *R. diversiloba* T. & G. POISON OAK. Erect and 4 to 5 ft. high, or ascending the trunks of trees by the means of aerial rootlets to the height of 15 to 20 ft.; leaflets orbicular to ovate or oblong-ovate, undulate, entire or variously lobed, segmented, or toothed; panicles axillary, appearing with the leaves, short-peduncled, more or less pendulous; flowers $1\frac{1}{2}$ lines long; sepals often unequal and sometimes 4; anthers yellow; fruit 3 lines broad, the stone striate.

Everywhere common throughout California. Flowering in Apr. and May. Few persons, like the author, enjoy complete immunity from the poisonous effects of this plant. Leaflets in size, outline and segmentation singularly variable, even on the same shrub. Fruit-clusters persisting on the naked branches well into midwinter, the thin skin of the drupes deciduous and exposing the dry whitish flesh which is marked with several longitudinal depressed blackish nerves.

2. *R. trilobata* Nutt. var. *quinata* Jepson. SQUAW BUSH. Somewhat diffusely branching, 2 to 5 ft. high; leaves 3-foliate; terminal leaflets 3-cleft, -parted or -divided, the divisions as also the lateral leaflets crenate or crenately lobed towards the apex; spikes about $\frac{1}{2}$ in. long, often clustered; flowers pale yellow, appearing before the leaves, 1 line long; sepals scarious; petals elliptic; disk yellow, 5-lobed, the lobes opposite the leaves and somewhat emarginate; fruit scarlet, viscidly pilose, the stone smooth.

Cañon bottoms or narrow mountain valleys, particularly along the banks of arroyos, either solitary or forming circular thickets 3 or 4 ft. high and several yards across. Throughout California, but not near the coast within our limits: middle and inner North Coast

Ranges; Mt. Diablo Range. Mar.-May. Sometimes called Western Sumach.

52. SAPINDACEÆ. BUCKEYE FAMILY.

Ours trees or shrubs with opposite compound leaves, no stipules, and irregular polygamous flowers. Ovary superior, 3-celled with 2 ovules in each cell. Endosperm none.

1. *ÆSCULUS* L. HORSE CHESTNUT.

Leaves palmately compound; leaflets serrate, stipules none. Flowers showy, on jointed pedicels, in a terminal thyrses, mostly sterile, only one or two in each thyrses perfecting fruit. Calyx tubular, unequally cleft. Petals 4 or 5, slightly unequal, clawed. Stamens 5 to 7, exserted and often unequal. Ovary 3-celled; ovules 2 in each cell, commonly but one ovule in the ovary maturing; style elongated. Fruit a large 3-valved capsule, loculicidally dehiscent. Seed without endosperm; coat thick and polished, with a large round scar; cotyledons very large and fleshy, somewhat coherent. (The ancient name of the tallest Italian Oak, having edible acorns and sacred to Jupiter.)

1. *Æ. Californica* (Spach) Nutt. BUCKEYE. A low tree, commonly 10 to 15 ft. high, with the rounded or depressed crown of greater breadth; inflorescence minutely pubescent, otherwise glabrous; leaflets 5 to 7 on petiolules, oblong-lanceolate to elliptic-oblong, acute or acuminate at apex, serrulate, 3 to 5 in. long; thyrses cylindrical, 4 to 6 in. long; flowers 4 or 5 lines long, ill-scented; calyx 2 to 3-lobed; corolla white; petals 7 lines long, the limb elliptic or ovate, rotately spreading, the claw on the back and margins minutely soft-pubescent; stamens commonly 6, becoming much exserted by elongation after the opening of the corolla, at first declined, 2 or 3 (usually the lower) elongating and becoming erect in advance of the others; fruit smooth, 1-seeded; seed $\frac{1}{2}$ in. in diameter.

Common throughout middle California, especially on the dry foothills; a beautiful tree when laden in June with its profusion of white flowers. Perfect flowers 2 or 3, sometimes 4 or 5, but always in the upper portion of the thyrses. The thyrses usually produces but one fruit; this is pendulous on the at length naked axis of the inflorescence, and on account of its size, color and hanging position explains the name, "California Pear," given it by the pioneers.

53. ACERACEÆ. MAPLE FAMILY.

Very closely allied to the preceding family, differing chiefly in the regular flowers and 2-celled ovary. Leaves palmately lobed or compound.

1. *ACER* L. MAPLE.

Trees or shrubs with palmately lobed leaves. Flowers polygamous or diœcious, small, in terminal racemes, umbel-like corymbs or

fascicles. Calyx cleft into mostly 5 segments. Petals as many or none. Stamens 3 to 8 or 10, borne on the edge of a disk, or hypogynous. Styles or stigmas 2, slender. Fruit a double samara, the body of the carpels united at the base or inner face and long-winged from the back or towards the apex. Samaras separable at maturity, each 1-seeded. Cotyledons large and thin. Endosperm none. (Latin, acer, sharp or hard, the wood anciently used for making pikes or lances.)

Flowers perfect; leaves simple, palmately lobed 1. *A. macrophyllum*

Flowers diœcious; leaves trifoliolate; var. *Californicum* of
2. *A. Negundo*.

1. **A. macrophyllum** Pursh. **LARGE-LEAVED MAPLE.** Tree 15 to 25 ft. high; juice in young herbage milky; leaves simple, roundish in outline, 7 in. broad or less, palmately parted into 5 broad mostly 3-lobed divisions; petioles about 3 in. long; racemes $2\frac{1}{2}$ to 4 in. long; flowers greenish or dull white; sepals elliptic, $2\frac{1}{2}$ lines long, equaled by the oblong petals; stamens 7 to 9, the filaments villous below; body of samaras densely hispid, the wing 1 to $1\frac{1}{2}$ in. long and 6 to 8 lines wide.

A not infrequent tree along Coast Range streams but solitary; it also ascends ravines and climbs cañon sides, appearing on the steepest north walls; in such cases it sometimes forms small clumps but the individuals are scarcely more than shrubs. Also in the Sierra Nevada. Mar. The wood is more valued than that of any other deciduous tree of western America.

A. GLABRUM Torr., Sierra Maple, of the High Sierras, and **A. CIRCINATUM** Pursh, Vine Maple, of northern California and northward, have the flowers in loose umbel-like corymbs and the fruits glabrous; in the former the filaments are glabrous, in the latter the filaments are hairy with the wings of the samaras spreading at right angles to the peduncle.

2. **A. Negundo** L. var. **Californicum** Sargent. **BOX ELDER.** Tree 20 to 50 ft. high; leaves pinnately trifoliolate, the leaflets serrate, incised, or 2 or 3 lobed or -divided, or the segments becoming distinct and obviously petioled, the central leaflets thus replaced by 3, or the lateral leaflets by 2 or 3; flowers diœcious; calyx minute, 4 to 5-cleft; petals and disk none; staminate flowers clustered on capillary pedicels, the stamens 4 or 5 and hypogynous; pistillate flowers in drooping slender racemes; fruit pubescent, 1 to $1\frac{1}{2}$ in. long; wing oblong, crimson in young fruit.—*Negundo Californicum* T. & G.)

Common along streams from San Bernardino northward: Contra Costa Co.; Sonoma Co.; Sacramento River. Mar.—Apr.

54. CELASTRACEÆ. STAFF-TREE FAMILY.

Shrubs with simple leaves (in ours opposite). Flowers small, perfect, regular, with jointed pedicels. Calyx 4 or 5-lobed or -parted. Petals 4 or 5. Stamens as many as the petals, alternate with them and inserted on a very thick and conspicuous disk. Ovary 2 to 5-celled,

immersed in or surrounded by the disk; ovules 2 in each cell; styles united into one, or none; stigma 3 to 5-lobed. Fruit a loculicidal capsule, free from the calyx. Seed ariled, with large embryo and broad and thin cotyledons; endosperm fleshy.

1. **EUONYMUS** L. BURNING BUSH.

Leaves opposite, petioled, deciduous. Flowers (in ours) 5-merous, purplish, in cymes on axillary peduncles. Petals inserted beneath the 5-lobed disk. Stamens inserted on the disk. Style short or none. Capsule 3 to 5-celled, 3 to 5-lobed, the cells 1 to 2-seeded. Seeds covered with a fleshy red aril.

1. **E. occidentalis** Nutt. BURNING BUSH. Erect, slender, 6 to 14 ft. high, the branches 4-angled; leaves thin, ovate or often broadest above the middle and abruptly acuminate, serrulate, $1\frac{1}{2}$ to 4 in. long, on petioles 3 lines long; peduncles 1 to $1\frac{1}{2}$ in. long, 3 to 5-flowered; flowers 4 or 5 lines broad; calyx-lobes broad and obtuse; petals roundish, brownish purple, finely dotted and with scarious margins; capsule depressed, smooth, deeply 3-lobed, often $\frac{3}{4}$ in. broad.

Near the coast: Santa Cruz Mountains, *McLean*, 1873; Marin Co.; Howards, Sonoma Co., *J. J. Rivers*; northward to Humboldt Co., *Marshall*. June.

PACHYSTIMA MYRSINITES Raf. Evergreen undershrub with coriaceous leaves $\frac{1}{2}$ to 1 in. long; flowers 1 line wide; ovary 2-celled.—Yuba Co. to Mt. Shasta.

55. **RHAMNACEÆ.** BUCKTHORN FAMILY.

Shrubs or small trees with simple leaves and mostly caducous stipules. Flowers small, regular. Stamens and petals 4 or 5, the lobes of the calyx as many. Petals perigynous, inserted with the stamens on a disk lining the calyx-tube, sometimes wanting, commonly clawed. Stamens alternate with the lobes of the calyx, that is, opposite the petals. Ovary mostly 3 (2 to 4)-celled, free or adnate by the disk to the base of the calyx. Style simple or 3 (2 to 4)-cleft. Fruit a berry or capsule.

Calyx free from the ovary; petals small or none, not hooded; fruit fleshy, berry-like 1. **RHAMNUS**.
Calyx adnate to base of ovary; petals hooded by inflexion of the tip; fruit dry, capsular 2. **CEANOTHUS**.

1. **RHAMNUS** L. BUCKTHORN.

Shrubs with alternate leaves and small greenish perfect or polygamous flowers in axillary clusters. Calyx with 4 or 5 short sepals or teeth. Petals very small or none; claws short. Stamens 4 or 5; filaments short. Ovary ovoid, free; style short, 3 to 4-cleft. Fruit berry-like, black, containing 2 to 4 separate seed-like nutlets of bony or cartilaginous texture. (The ancient Greek name of these plants.)

Flowers complete; fruit black.
Leaves thickish, mostly 1 to 2 in. long 1. *R. Californica*.
Leaves thinnish, 3 to 6 in. long 2. *R. Purshiana*.
Flowers apetalous, often polygamous; fruit red 3. *R. crocea*.

1. **R. Californica** Esch. COFFEE BERRY. Shrub, commonly 4 or 5 ft. high, evergreen in our district; one-year-old branchlets reddish or brown; leaves oblong, obtuse or acute, mostly $1\frac{1}{2}$ to 2 in. long; flowers mostly perfect, 4 to 5-merous, on short pedicels, in umbellate clusters, the clusters peduncled; calyx 2 to $2\frac{1}{2}$ lines broad; its lobes triangular-lanceolate; petals minute, cucullate, deeply emarginate; fruit a black berry, globose or oval, 3 to 4 lines in diameter.

Common everywhere in the Coast Ranges and at low altitudes in the Sierras. June-July. Fr. Sept.-Oct.

Var. **tomentella** Brew. & Wats. Twigs tomentose, reddish; leaves yellow- or white-tomentose beneath; peduncles commonly exceeding the petioles.—Santa Cruz Mountains; Mt. Hamilton; Sierra Foothills and eastward.

2. **R. Purshiana** DC. CASCARA SAGRADA. Small tree; leaves thinnish, deciduous, elliptic-oblong, obtuse or slightly cordate at base, obtuse or abruptly blunt-pointed at apex, serrulate, mostly 3 to 6 in. long; petioles tomentulous; flowers 5-merous; carpels 3.

Point Reyes acc. to *Davy*; scarcely known in our region, more common in northern California.

3. **R. crocea** Nutt. Evergreen and glabrous low shrub $\frac{1}{2}$ to 2 or 3 ft. high. the branches and branchlets slender, flexible and rather long; leaves often fascicled, rather narrowly elliptic, 1 to 4 lines long, serrulate, green above, yellowish beneath, distinctly petioled but the petioles often less than $\frac{1}{2}$ line long; flowers apetalous, mostly polygamous; sepals and stamens 4; fruit 2 or 3 lines long, red.

Mayacamas Mountains (east of Napa Valley) and southward near the coast: Oakland, etc. Feb.-May.

Var. **ilicifolia** Greene (*R. ilicifolia* Kellogg). Somewhat arborescent with a distinct trunk, or the stems several and clustered, 5 to 10 ft. high; branchlets short, rigid and rather stout; leaves oval, firm-coriaceous, green above, yellowish brown or golden beneath, larger than in the type (7 to 10 lines long), spinulose-dentate; sepals and stamens frequently 5; fruit bright red, ovoid, $2\frac{1}{2}$ lines long.—Inner Coast Ranges (Miller Cañon, Vaca Mountains, but rare); common in Mitchell Cañon, Mt. Diablo; well known southward. Fruiting in Sept.

2. **CEANOTHUS** L. MOUNTAIN LILAC.

Shrubs or small trees, with petioled leaves, the branchlets often divaricate and rigid, sometimes spinescent, and the small but showy flowers in thyrses or cymes. Calyx 5-lobed, the lobes acute, incurved; the lower part adnate with the thick disk to the lower part of the 3-celled ovary. Petals 5, hooded by the inflexion of the acuminate apex, and with long claws. Stamens 5, filaments filiform, long-exserted. Style 3-cleft. Fruit subglobose, 3-lobed, becoming dry and separating into its 3 carpels, these elastically dehiscent along the inner edge and dispersing the seeds. Seeds obovate, convex on the back. (Greek *Keanothus*, name used by Dioscorides to designate some spiny plant, applied to this genus of American plants, which

are chiefly of the Pacific United States. All of our species are evergreen except *C. integerrimus* and *C. Parryi*. According to the field investigations of Mrs. K. Brandegee, the nearly related species give rise to numerous hybrids. Cf. Proc. Cal. Acad., 2d Ser., iv. 173.)

A. Leaves alternate.

Fruit smooth or at most crested, never with horns; stipules thin or membranous, fugacious or deciduous.

Branches flexible, not spinescent.

Flowers white; leaves plane.

Inflorescence compound; leaves very strongly 3-nerved beneath, $1\frac{1}{2}$ to 3 in. long; fruit slightly crested 1. *C. velutinus*.

Inflorescence simple or compound; leaves entire, $\frac{1}{2}$ to 1 in. long; fruit crestless 2. *C. integerrimus*.

Flowers blue (rarely varying to white); inflorescence compound.

Leaves plane, mostly 1 to $2\frac{1}{2}$ in. long, strongly 3-nerved, serrulate 3. *C. thyrsiflorus*.

Leaves similar, pinnately veined, but the margins revolute, seemingly entire, and sometimes concealing the supplementary lateral nerves 4. *C. Parryi*.

Flowers blue, the clusters in a simple raceme mostly $\frac{1}{2}$ to 1 in. long; leaves mostly rather small, usually not 3-nerved.

Leaves subcoriaceous, with smooth waxy surface, the margin very glandular-serrate 5. *C. foliosus*.

Leaves papillate near the revolute margin 6. *C. dentatus*.

Leaves similar, but glandular-papillate on the entire upper surface 7. *C. papillosus*.

Branches more or less rigid and spinescent.

Leaves glandular-serrate; flowers deep or very light blue, in a simple raceme; branchlets stiff 8. *C. sordidatus*.

Leaves entire; flowers white, in a simple or paniculately compound raceme; branchlets thick and stout, spur-like, very glaucous; fruit warty-roughened; leaves strongly 3-nerved 9. *C. incanus*.

B. Leaves opposite.

Fruit with conspicuous dorsal horns; stipule-bases warty or cork-like and persistent.

Erect shrubs.

Flowers white; leaves entire 10. *C. cuneatus*.

Flowers blue; leaves finely spinose-dentate on the upper half 11. *C. rigidus*.

Flowers blue (or white); leaves rather coarsely spinose-dentate.

Branchlets gray; pedicels 2 lines long 12. *C. Jepsonii*.

Branchlets reddish or brownish; pedicels 5 to 7 lines long 13. *C. purpurea*.

Low-spreading shrub; flowers blue; leaves coarsely few-toothed toward the apex: var. *divergens* of 14. *C. prostratus*.

1. *C. velutinus* Dougl. SNOW BRUSH. Large shrub, 8 to 12 ft. high, the branches mostly ascending; odor very sweet and heavy; leaves elliptic or ovate, rounded or subcordate at base, finely glandular-serrate, pale and strongly 3-nerved beneath, varnished above and frequently of a rich chocolate-brown, $1\frac{1}{2}$ to 3 in. long, on petioles $\frac{1}{2}$ in. long or less; panicle 2 to 3 in. high; flowers white, 2 lines broad; fruit smooth, lobed at top, nearly crestless, sticky-glandular.

Mt. Shasta; Modoc Co.; and the northern Sierra Nevada.

Var. *laevigatus* T. & G. Subarborescent; leaves glabrous, light green; inflorescence more ample; fruit somewhat crested.—Mt. St. Helena and northward in the Coast Ranges to Mendocino and Humboldt Cos.

2. *C. integerrimus* H. & A. Tall shrub, 10 to 15 ft. high; twigs green or at length purplish subangular when young; leaves deep green above, paler beneath, oblong-elliptic, obtuse, mostly acute at base, entire, $\frac{1}{2}$ to 1 in. long; inflorescence simple and about 2 in. long, or compound and about 4 in. long, or in fruit twice as long, equaled by the leafy (or often nearly leafless) peduncles; flowers white; capsules nearly globose, lobed, smooth, crestless.

Seemingly very restricted in its range: Santa Cruz Mountains. May. Fruiting in July.

3. *C. thyrsiflorus* Esch. CALIFORNIA LILAC. Low shrub, 3 to 6 ft. high or becoming a small tree 12 to 18 ft. high, rather straight-limbed, the branchlets mostly ascending; leaves green on both surfaces, elliptical or oblong-ovate, strongly 3-nerved beneath, the margin mucronate-serrate or serrulate with somewhat impressed teeth, 1 to $2\frac{1}{2}$ in. long, 6 to 10 lines broad; inflorescence a panicle of somewhat corymbose racemes, $1\frac{1}{2}$ to $2\frac{3}{4}$ in. long, mostly long-peduncled, with leaves subtending 1 or 2 of the lower racemes; bractlets ovate, acuminate, $2\frac{1}{2}$ lines long; flowers blue or sometimes varying to white; capsule globose, smooth, little lobed, 2 lines in diameter.

Common near the coast from Monterey northward to Sonoma and Mendocino Cos. Apr. Near Soquel, Setchell and Jepson discovered, in 1896, a fine shapely tree 22 ft. high, with a girth of 2 ft. 5 in. at 20 in. from the ground.

4. *C. Parryi* Trelease. PARRY'S LILAC. Spreading shrub, 4 to 6 ft. high; branchlets angular and, when young, tomentose, the 1-year-old ones reddish; leaves pinnately veined, narrowly to broadly oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, dark green above, loosely tomentose beneath, the margin denticulate, seemingly entire because soon revolute and thus concealing the teeth and also the lateral supplementary nerves; petioles 2 lines long; panicle oblong or distinctly broader below, 1 to 3 in. long, on sparsely leafy peduncles twice as long; capsules globose, smooth, 2 lines in diameter.

Local species of the mountain ranges on either side of Napa Valley: Mt. George; Caux's Knob; Rebecca Ranch grade, southwest of Calistoga. A most handsome shrub when in full flower in Apr. or early May; at other seasons of straggly and unattractive habit, the individuals often seeming as if of great age. Sometimes found in flower in the late fall and early winter. Margin of leaf variable, sometimes serrate, more often rather obscurely denticulate or almost entire.

5. *C. foliosus* Parry. Low shrub commonly dense at base, with horizontally spreading or diffuse branches 2 or 3 ft. long; branchlets rather long and straight and rather ascending; lightly pubescent, especially on the branchlets; leaves undulate or somewhat infolded longitudinally, mostly 3 or 4 or the larger 6 lines long, frequently with smaller ones fascicled in their axils, broadly oblong, upper surface dark green, lower lighter, the teeth of the margin bearing conspicuous glands; petiole distinct but very short; inflorescence globose

to oblong, $\frac{1}{2}$ to 1 in. long; flowers blue, 1 to $1\frac{1}{2}$ lines broad; capsules $1\frac{1}{2}$ lines broad, smooth, conspicuously lobed, crested.

Rather common in the seaward and middle Coast Ranges north of San Francisco Bay: Mt. Tamalpais; Sonoma; Howell Mt.; Mt. St. Helena, and northward to Westport, Mendocino Co. Apr.-May, or flowering late in the season, the inflorescence then short-spicate and interrupted below.

6. *C. dentatus* T. & G. Low densely branched shrub with reddish brown branchlets, the young twigs tomentose; leaves elliptical or narrower, rounded at both ends or appearing retuse or subtruncate from the infolding of the apex, dark brown and waxy on the upper surface, light colored and pubescent beneath, papillate on and near the margin, 2 to 5 or 6 lines long; inflorescence subglobose, very tomentose; flowers blue; capsule slightly crested, scarcely lobed, 2 lines in diameter.

Santa Cruz Mountains.

7. *C. papillosus* T. & G. Habit of the last and differing little from it; leaves often slightly cordate at base, the whole upper surface closely glandular-papillate, 1 in. long or less, sometimes as much as 2 in. long; inflorescence more oblong, about 1 in. long; peduncles naked, solitary or clustered; capsules rather less than 2 lines in diameter.

Santa Cruz Mountains. May.

8. *C. soledatus* H. & A. Erect shrub, 4 to 7 ft. high, with rigid divaricate branchlets; branchlets sparingly villous, at length olive-color or purplish; leaves ovate or elliptic-ovate, green above, paler and slightly pubescent beneath with appressed hairs, glandular-denticulate, $\frac{1}{3}$ to 1 (or less commonly $1\frac{1}{2}$) in. long, on petioles a line or two long; racemes 1 or 2 (terminal or subterminal) on each branchlet, ovate or broadly oblong in outline, $\frac{1}{2}$ to 1 in. long; flowers blue or almost white; capsule lobed, crested, 2 to $2\frac{1}{2}$ lines in diameter.

Very common in the Coast Ranges, the individuals disposed to associate, and, at flowering time, often coloring the north cañon sides in patches: Vaca Mountains; Caux's Knob, west of St. Helena; Howell Mountain; Oakland Hills; Mt. Diablo; and southward. Mar.-Apr.

9. *C. incanus* T. & G. Tall shrub with very glaucous branchlets, these thick and stout and almost spur-like; leaves elliptic to ovate, acute or obtuse, rounded at base, dark brown above, strongly 3-nerved and pale (with a fine close indument) beneath, 1 to $1\frac{1}{2}$ in. long; petioles 2 or 3 lines long; inflorescence finely velvety, 2 or 3 in. long or less; flowers white; capsule thickly warty, shallowly lobed at top, $2\frac{1}{2}$ lines in diameter.

Felton and Ben Lomond (Santa Cruz Co.) to Mt. St. Helena; Lake and Mendocino Cos.

10. *C. cuneatus* Nutt. NUTTALL'S CEANOTHUS. Rigid divaricately branched shrub, 5 to 8 ft. high, with gray bark; branchlets stout and short, those on a branch often very unequal and frequently interruptedly disposed; leaves oblong-obovate to broadly obovate, entire,

green above, paler beneath, 4 to 6 or less commonly 11 lines long, on very short petioles; umbels $\frac{1}{2}$ to $\frac{3}{4}$ in. broad; pedicels 2 to 4 lines long; flowers white; capsules slightly oblong, $2\frac{1}{2}$ lines long, with three short erect horns.

Very abundant in the higher Coast Ranges and in the Sierra Foot-hills, either isolated, or gregarious and forming impenetrable and often extensive thickets. Such thickets clothe densely the higher slopes and mountain ridges, and whether made up purely of this species or mixed with Manzanita, Pickeringia or similar shrubs, are known as chaparral. Flowering in Mar.-Apr., the odor sweetish but slightly offensive. R. H. Platt sends specimens from the Vaca Mountains some of the leaves of which are 2 to 3-dentate at apex.

11. *C. rigidus* Nutt. Shrub about 6 ft. high, rigidly and intricately branched; leaves opposite and crowded, cuneate-obovate, mostly retuse, firm but rather thin, soon nearly glabrous on both surfaces, the apical half finely spinose-dentate, 2 to 6 lines long, nearly sessile; stipules conspicuously warty; flowers bright blue; capsules a little larger than in no. 10.

Rare: Mt. Tamalpais and Bolinas Heights to Monterey, where first collected by Nuttall.

12. *C. Jepsonii* Greene. Rigid strictly erect shrub about 4 to 5 ft. high; branchlets short, stubby, gray; leaves elliptic-oblong, spiny-toothed, undulate-margined or somewhat infolded longitudinally, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; stipules small; flower-clusters small, pedicels 2 or 3 lines long; flowers white.

Abundant between Middleton and the Toll House on Mt. St. Helena (type locality), flowers white; Howell Mt., flowers blue, exhaling a musky odor, the air for some distance around a shrub or thicket heavy with the fragrance; Marin Co. Feb.-May.

13. *C. purpurea*. Erect shrub, 4 or 5 ft. high with brownish or reddish branchlets; leaves very thick, orbicular, 1 in. long or less, glabrous, shining and light green above, paler beneath with a closely appressed tomentum, coarsely and pungently toothed all around; stipules very large; flowers large, purple; pedicels 5 to 7 lines long; fruit unknown.

Gorges north of Mt. George near Napa. May. Nearly allied to *C. crassifolius* Torr. (San Diego Co. northward to the Santa Inez Mountains) which has elliptic-obovate leaves with more finely toothed or subentire revolute margin, the upper surface roughened, the lower surface densely white tomentose; capsule subglobose, with 3 stout suberect horns near the top, 3 to 4 lines in diameter. This species has been found at Wright's, Santa Cruz Mountains, acc. to Behr.

14. *C. prostratus* Benth. MAHALA MATS. Branches prostrate, rooting, thickly matting the ground; branchlets often reddish, at first pubescent; leaves green on both surfaces, glabrous or finely flocculent-pubescent beneath, thick and firm, cuneate-obovate, coarsely and pungently 3-toothed at the apex, and commonly with 1 or 2 similar teeth at or above the middle; flowers blue; fruit globose, not lobed,

with 3 large wrinkled horns on each valve and 3 intermediate crests, 3 to 4 lines long.

Sierra Nevada, where it is common, often extensively covering the ground in the Yellow Pine (*Pinus ponderosa*) woods; Mt. Shasta; southward in the north Coast Ranges through the Yalho Bally Mountains and Snow Mountain, Lake Co., to Cobb Mountain where it passes into the following.

Var. *divergens* Brandege (C. *divergens* Parry). Low scrambling shrub with horizontally spreading, trailing or almost procumbent branches; leaves more dentate-spinose than in the type, almost sessile, $\frac{1}{2}$ to $\frac{1}{2}$ in. long; flowers blue; capsules about 3 lines in diameter, with the horns more lateral.—Mt. St. Helena; Sonoma; Marin Co.; Santa Cruz Co. May.

56. VITACEÆ. VINE FAMILY.

Woody plants, mostly climbing by tendrils. Leaves in ours simple, alternate. Flowers small, regular, greenish or whitish, in a compound thyrse. Calyx minute, the limb mostly obsolete and truncate. Petals 4 or 5, valvate, caducous or early deciduous, the stamens as many and opposite them. Fruit a 2-celled berry. Seeds with a thick and bony testa. Embryo minute, in a tough endosperm.

1. VITIS L. Grape.

Leaves opposite the tendrils or flower clusters. Tendrils at least once branched. Calyx-tube filled with the disk, which bears the stamens and petals. Ovules 2 in each cell. (Classical Latin name.)

1. *V. Californica* Benth. CALIFORNIA WILD GRAPE. Leaves roundish, tomentose, especially beneath, the tomentum in age flocculent, 2 to $5\frac{1}{2}$ in. broad, coarsely or minutely dentate, cordate at base with open or closed sinus, slightly or not at all lobed, or frequently with a sinuately 3 to 5-lobed leaf at the next node above or below an unlobed one; fruit purple, with a bloom, 3 or 4 lines in diameter.

Along streams throughout the Coast Ranges, Sacramento and San Joaquin Valleys, and Sierra Foothills. Climbing trees, especially Oaks and Cottonwoods, and frequently killing such by covering them with its drapery of leaves. Very fragrant at flowering time (May-June) with a pleasant sweet odor.

57. THYMELÆACEÆ. MEZEREUM FAMILY.

Ours shrubs with simple entire alternate leaves and no stipules. Flowers perfect, with corolla-like 4-cleft calyx. Stamens inserted upon the calyx, twice as many as its lobes. Corolla none. Ovary superior, 1-celled; ovule 1, pendulous.

1. DIRCA L. LEATHERWOOD.

Deciduous shrubs with perfect flowers in fascicles from mixed buds, *i. e.*, buds containing flowers and leaves. Scales of the bud yellow-

ish or whitish, silky, forming an involucre to the flowers, caducous. Perianth slightly oblique, tubular below, expanded into a short throat above. Stamens 8, 4 exserted, the alternate shorter, inserted at the base of the throat. Style slender, exceeding the stamens. Fruit drupe-like, reddish. (Classical Greek name of a celebrated fountain in Bœotia.)

1. *D. occidentalis* Gray. WESTERN LEATHERWOOD. An erect shrub, 2 to 4 ft. high, with very tough stems and leathery bark; flowers yellow, in clusters of 2 or 3 from lateral and terminal buds, nodding; perianth-tube 2 or 3 lines long, greenish, expanding above into a distinct throat about 1 line long, the limb 4-cleft; ovary slightly oblique.

Northerly slopes in cañons. Nov.-Feb. The color of the mature fruit has not been observed by the author.

58. EUPHORBIACEÆ. SPURGE FAMILY.

Ours herbs, or one species somewhat suffrutescent. Leaves simple, stipulate or exstipulate. Flowers (in ours) monœcious, always apetalous, often naked, *i. e.*, destitute of calyx as well, sometimes exceedingly reduced and enclosed in a calyx-like involucre. Stamens 1 to many. Ovary superior, 3 or 1-celled, with one or two pendulous ovules in each cell. Styles or stigmas as many or twice as many as the cells of the ovary. Capsule commonly 3-lobed, 3 or 2-valved. Embryo straight, the flat cotyledons almost as wide as the fleshy or oily endosperm.

Flowers with a true calyx, not borne in an involucre; herbage densely stellate-pubescent.

Upper leaves opposite; staminate flowers in corymbs; capsule 1-celled . .

1. EREMOCARPUS.

Leaves all alternate; staminate flowers in racemes; capsule 3-celled . . .

2. CROTON.

Flowers borne in a calyx-like involucre, which has 4 or 5 teeth and bears more or less petal-like glands; true calyx none; capsule 3-celled. . . .

3. EUPHORBIA.

1. EREMOCARPUS Benth.

A low annual with entire 3-nerved leaves without stipules. Staminate flowers in corymbs; calyx 5 to 6-parted; stamens 6 or 7 on a hairy receptacle; filaments exserted. Pistillate flowers 1 or few in the lower axils, without calyx; ovary 1-celled, with 4 or 5 small glands at the base; style undivided, stigmatic at apex; capsule 2-valved, 1-seeded. (Greek eremos, solitary, and karpos, fruit.)

1. *E. setigerus* Benth. TURKEY MULLEIN. Herbage gray with an appressed stellate pubescence and rough with spreading hispid hairs; stems dichotomously branched, procumbent or prostrate and forming a close mat 1 to 2 ft. wide or more, rarely with ascending branches; leaves alternate or the upper opposite, thick, ovate, the smaller varying to almost round, $\frac{1}{3}$ to $1\frac{1}{2}$ in. long, the petioles nearly as long or longer; staminate flowers pediceled, the oblong segments of the calyx 1 line long; pistillate flowers in clusters of 1 to 3, the

ovary and style densely pubescent; capsule 2 lines long; seed smooth and shining, $1\frac{1}{2}$ lines long.

Very abundant towards the interior: plains of the Sacramento and San Joaquin; Sierra Foothills; low hills and valley fields of the Coast Ranges. The California Indians used the heavy-scented herbage of this plant to stupefy fish in small streams in order that they might be caught by hand, whence the Spanish-Californian name, Yerba del Pescado. The seeds are sought by turkeys.

2. CROTON L.

Ours perennial herbs, suffrutescent at base, with alternate entire leaves. Staminate flowers in racemes; calyx 5-parted; glands of the disk as many as and alternate with the petals; stamens 5 to many. Pistillate flowers mostly solitary; calyx 5-parted; ovary 3-celled, the cells 1-ovuled; styles twice forked. Capsule 3-lobed, globose in outline. Seeds smooth and shining, with a caruncle. (Kroton, a tick, the Greek name of the Castor Plant, its seeds resembling that insect.)

1. **C. Californicus** Müll. Arg. Stems branching, erect or diffuse, from a woody base; herbage hoary, except the upper side of the leaves which is green and finely stellate-pubescent; leaves oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, on petioles 4 lines to over 1 in. long; staminate racemes at length $\frac{1}{2}$ in. long, developing gradually, the flowers soon deciduous after anthesis and leaving an elongated naked rachis; staminate calyx about 1 line long; disk obscurely 5-lobed; stamens 9 to 11, with hairy filaments; pistillate flowers on short pedicels; styles twice forked; capsule scurfy, 3 lines in diameter.

Sandy hills near the ocean from the San Francisco peninsula southward to Southern California; also near Antioch(!). A bitter tea is made from the leaves and used for rheumatism by Spanish-Californians.

3. EUPHORBIA L. SPURGE.

Ours herbs. Involucres solitary in the forks or in terminal umbels, with 4 or 5 teeth alternating with as many glands; glands either naked or appendaged (*i. e.*, with a colored margin). Flowers monœcious, both pistillate and staminate naked and included in an involucre which itself resembles a flower but really encloses a cluster of flowers consisting of several staminate and 1 pistillate flower. Staminate flower very much reduced, consisting of a single stamen; filament jointed on a short pedicel like it, the pedicel often with a minute scale or bract at base, showing that the stamen is a distinct flower. Pistillate flower supported on a pedicel in the center of the involucre and soon protruded from it, consisting of a 3-celled ovary and 3 bifid styles. Capsule with 3 cells, each 1-seeded. (Euphorbus, King Juba's physician.)

Stems prostrate; leaves small, all opposite and more or less unequal at base, stipulate; glands of the involucre with a petal-like white or reddish appendage.

Herbage glabrous; stems and leaves infrequently reddish.

Leaves obovate or oblong, minutely serrulate at apex. 1. *E. serpyllifolia*.

Leaves deltoid to ovate-oblong, entire 4. *E. ocellata*.

Herbage often hairy or puberulent; leaves commonly margined with a red or with a central red spot.

Stipules lanceolate, fimbriate 2. *E. maculata*.

Stipules triangular, slightly lacerate. 3. *E. hypericifolia*.

Stems erect; leaves larger, stipules none; no colored margins to the glands. Stem-leaves alternate.

Glands disk-like, entire; capsule with warty lobes . . . 5. *E. dictyosperma*.

Glands crescent-shaped, 2-horned; capsule smooth. . . 6. *E. leptocera*.

Stem-leaves in 4 ranks; glands crescent-shaped 7. *E. Lathyris*.

1. *E. serpyllifolia* Pers. THYME-LEAVED SPURGE. Stems round, or more or less angled, repeatedly branched, forming prostrate mats 1 to 3 ft. across; herbage glabrous and green; leaves oblong or obovate-spatulate, unequal at base, more or less minutely serrate toward the apex; stipules setaceous or lacerate; involucre $\frac{1}{2}$ line long or less; glands transversely oblong and more or less cupped in the center; appendages narrow, crenately serrate or nearly entire; seeds sharply quadrangular, slightly rugose or more manifestly so and thus appearing shallow-pitted.

Stream beds and low grounds in the Coast Range region (Santa Clara; Santa Rosa), and from Putah Creek and the Sacramento River southward. Aug.-Oct.

Var. *consanguinea* Boiss. Herbage with more or less red coloration; stems more erect; apex of leaves sharply serrate; lobes of the involucre lacerate; seeds less sharply angled.—Upper Sacramento Valley; Napa Valley.

Var. *rugulosa* Engelm. (*E. rugulosa* Greene). Plants more thickly matted; leaves more serrate on the larger side of the unequal leaf; seeds finely rugulose.—Suisun; Berkeley.

Var. *occidentalis* (*E. occidentalis* Drew). Herbage dull yellowish green; appendages of the involucre crenately lobed; seeds sinuate-rugose.—Humboldt Co. and Mt. St. Helena.

2. *E. maculata* L. SPOTTED SPURGE. Herbage hairy or puberulent; stems radiately branching, prostrate; leaves oblong-linear, usually with a red blotch in center, serrulate, subcordate at base; stipules fimbriate; involucre with 4 cup-shaped glands; capsule acutely angled; seeds transversely wrinkled and minutely pitted.

Occurring as an immigrant from the eastern U. S. acc. to Greene.

3. *E. hypericifolia* L. LARGER SPURGE. Glabrous or sparingly hairy, ascending or sometimes prostrate, the branches $\frac{3}{4}$ to $1\frac{1}{2}$ ft. long; leaves ovate-oblong to oblong-linear, 3-nerved, unequally serrate, commonly with a red spot or red margins; stipules triangular, slightly lacerate; peduncles longer than the petioles; appendages of the involucre white or red, entire; capsule glabrous, obtusely angled; seeds with broken transverse ridges.

Introduced in Napa Valley along the railroad track. Specimens determined by C. F. Millspaugh.

4. *E. ocellata* Dur. & Hilg. Annual, prostrate, the branches 5 to 9 in. long; leaves thickish, deltoid to ovate-oblong, often cordate at base, entire, 2 to 4 lines long; involucre campanulate, nearly 1 line long, its lobes fringed; glands 2 to 4, yellowish or purplish, short-

stipitate, circular and discoid, with or without a narrow margin; capsule 1 line long; seeds round-ovate, smooth or obscurely rugose.

Stockton, *Sanford*, and southward through the San Joaquin Valley to Southern California.

5. *E. dictyosperma* F. & M. Annual, glabrous; stems erect, 5 to 15 in. high, simple or branching from the base, dichotomously branched above; stem-leaves alternate, oblong- or obovate-spatulate, serrulate, often retuse, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; upper and floral leaves opposite, round-ovate to oblong, 3 to 6 lines long; inflorescence umbelliform, the rays 2 or 3 times forked; involucre and glands small; capsule with warty lobes, 1 to $1\frac{1}{4}$ lines long.

Throughout California but much less common than no. 6. Sacramento Valley.

E. PEPLUS L., Petty Spurge, is sometimes spontaneous within inclosures at Berkeley; the involucre bears 4 crescent-shaped glands with long slender horns, and a pair of wing-like crests on each lobe. *E. EXIGUA* L., reported as occurring in Santa Clara Co., has linear cauline leaves and a smooth capsule.

6. *E. leptocera* Engelm. Annual or biennial, glabrous, branching at base, 10 to 16 in. high; branches decumbent at base or commonly erect, 2 or 3 times dichotomous above; leaves alternate, obovate to spatulate, obtuse, sometimes mucronate, entire, 4 lines to $1\frac{1}{4}$ in. long; the floral opposite or ternate, deltoid or broadly rhombic-ovate, sometimes cordate at base or connate, acute, 3 to 5 lines long; involucre turbinate, its transversely oblong lobes denticulate; glands large, crescent-shaped, the slender horns entire or cleft; capsule smooth, $1\frac{1}{2}$ lines broad; seeds ash-colored, dark-pitted, $1\frac{1}{2}$ lines long, with a prominent caruncle.

Common. Coast Ranges: Vacaville; Ukiah; San Francisco; Sierra Nevada.

7. *E. Lathyris* L. CAPER SPURGE. Tall stout annual or biennial, 1 to 3 ft. high, very smooth and glaucous; stem-leaves linear or narrowly oblong, thick, in 4 vertical ranks, the floral oblong-ovate and cordate; umbels of 3 or 4 rays, once or twice forked; glands of the involucre crescent-shaped, the horns short and blunt; capsule large and smooth; seeds wrinkled.

Naturalized about the early settlements of Alta California: San Francisco Co.

59. CALLITRICHACEÆ. WATER STARWORT FAMILY.

Herbs growing in shallow water or in the mud of vernal pools from which the water has disappeared. Leaves opposite, entire, exstipulate, often crowded and forming a rosette at the ends of the branches. Flowers monœcious, axillary and solitary, or 2 or 3 together in one axil, without calyx or corolla but often with two membranous bracts. Staminate flower consisting of 1 terminal stamen. Pistillate flower consisting of a 4-celled ovary with 2 filiform stigmas. Fruit 4-lobed, splitting at maturity into as many nutlets.

1. **CALLITRICHE.** L.

The only genus. (Greek kallos, beautiful, and trichos, a hair, on account of the slender stems.)

Fruit sessile; flowers 2-bracted; submerged leaves retuse or bifid at apex.

Fruit on a pedicel 2 to 5 lines long; flowers bractless; leaves not notched at apex. 1. *C. palustris*.
 2. *C. marginata*.

1. ***C. palustris* L.** WATER FENNEL. Aquatic; stems 5 to 10 in. long; submerged leaves narrowly linear, 1-nerved, notched at the apex, 7 to 10 lines long; emerged or floating leaves obovate, narrowed at base into a slender petiole, 2 to 6 lines long; fruit obovate, flattened, notched at apex, $\frac{1}{2}$ to 1 line long; each lobe sharply winged on the back for its whole length, the proximate lobes with a groove between them.

Cold pools or slow streamlets. Napa Valley; Marin Co.; Gilroy. Mar.-May.

2. ***C. marginata* Torr.** Stems 2 to 4 in. long, forming dense mats in the moist beds of vernal pools from which the water has disappeared; leaves oblanceolate, 2 or 3 lines long; plants sometimes submersed and the leaves linear; bracts none; styles long, reflexed, soon deciduous; fruit rather less than $\frac{1}{2}$ line long, broader than long, notched both at apex and base, the lobes sharply winged; fruiting pedicels 2 to 5 lines long.

Stanislaus and San Mateo Cos. (acc. to Bot. Cal.), northward to Napa Valley and Sonoma Co.

60. **CRASSULACEÆ.** STONE-CROP FAMILY.

Succulent herbs with entire exstipulate leaves. Flowers in cymes, small, perfect and regular. Sepals, petals and pistils of the same number (in ours 4 or 5), and the stamens as many or twice as many. Petals generally slightly perigynous, distinct or united at base. Fruit a dry many-seeded follicle. Receptacle usually with nectar-bearing scales on the receptacle, one behind each pistil.

Leaves opposite; the stamens as many as the petals; diminutive annuals.

Leaves alternate, the basal in conspicuous rosettes; stamens twice as many as the petals. 1. *TILLÆA*.

Perennials or annuals; petals distinct; follicles spreading when fully ripe. 2. *SEDUM*.

Perennials, coarser than the last; petals more or less united at base; follicles erect or suberect. 3. *COTYLEDON*.

1. **TILLÆA** L.

Small and slender glabrous annuals with opposite leaves. Flowers minute, axillary, white or pinkish. Sepals and petals 3 to 5 (in ours 4), distinct or united at base, the stamens as many. Pistils distinct with almost obsolete styles. Follicles 1 to several-seeded, the seeds striate longitudinally. (Michael Angelo Tili, Italian botanist.)

Flowers clustered; petals broadly subulate; follicles 1 to 2-seeded.

1. *T. minima*.

Flowers solitary; petals oblong; follicles several seeded. 2. *T. Drummondii*.

1. ***T. minima*** Miers. Simple or with several ascending or erect branches, $\frac{1}{2}$ to 3 in. high; herbage of the adult plants reddish; leaves ovate or oblong, obtuse, 1 line long; flowers axillary, subsessile or occasionally on pedicels 1 or 2 lines long; sepals, petals and stamens 4, the sepals equaling the broadly subulate petals; follicles 1 to 2-seeded.

Common on finely disintegrated sandstone or other rock from Vanden (Solano Co.) and Sonoma southward. Mar.-Apr.

2. ***T. Drummondii*** T. & G. Stems very slender, dichotomous, decumbent at base and rooting at some of the lower nodes, 1 in. long or more; leaves linear-oblong, acute, 1 to 2 lines long; pedicels at length equaling or exceeding the leaves; petals oblong, red, 2 to 3 times the length of the calyx-lobes; carpels obtuse.

Moist places in the lower Sacramento Valley. May.

Var. ***Bolanderi*** Wats. (*T. Bolanderi* Greene.) Stems 3 in. long; leaves 2 lines long; flowers on short pedicels; pedicels elongated in fruit (6 lines long).—Presidio, San Francisco. May.

2. **SEDUM** L. STONE CROP.

Fleshy glabrous herbs, erect or decumbent, with alternate leaves. Flowers pale yellow or white, in terminal often 1-sided cymes. Calyx divided nearly to the base into 4 or 5 sepals. Petals distinct. Stamens perigynous, the alternate ones usually attached to the petals. Pistils distinct, rarely united at the base, becoming few to many-seeded follicles, spreading when ripe; styles usually short. (From the Latin *sedeo*, to sit, on account of the lowly habit.)

Basal leaves in rosettes.

Leaves thick, not nerved; perennial 1. *S. spathulifolium*.

Leaves comparatively thin, very obviously nerved when dry; perennial (?) 2. *S. radiatum*.

Leaves all scattered, 1 to 2 lines long; annual 3. *S. pumilum*.

1. ***S. spathulifolium*** Hook. Glaucous; leaves flat, obovate or spatulate, obtuse, 5 to 9 lines long, either condensed in small somewhat depressed rosettes which are sessile on the caudex or on its prostrate branches, or sessile on the flowering branches, the latter rather smaller; flowering stems ascending, 4 to 6 in. high; flowers on short pedicels or sessile, 3 lines long, yellow; petals lanceolate, acute, twice longer than the ovate acute sepals, scarcely exceeding the stamens and style.

Common on rocky walls on the north or shady side of cañons: Mt. Diablo; Oakland Hills and northward.

2. ***S. radiatum*** Wats. Perennial; stems several, simple or branching, from a slender rootstock, 4 to 6 in. high; cauline leaves oblong to oblong-ovate, acute, sessile by a rather broad base, 3 to 5 or 6 lines long, nearly or quite as long as those of the globose or oblong rosettes at the base of the stem, all when dry delicately but rather conspicuously nerved; sepals short, triangular, acute; petals yellow,

narrowly lanceolate, acuminate, 3 lines long; follicles broad, abruptly divergent from the united bases.

Summit of Gabilan Peak, Monterey Co., *Brewer*; Mt. Hamilton, *Greene*; and northward to Marin Co., *Congdon*; Mendocino Co., *Chesnut* and *Drew*. Rarely collected. Annual, acc. to *Greene*, and propagating by deciduous buds formed in the axils of the lowest leaves.

3. *S. pumilum* Benth. Branching from just above the base, or sometimes simple, 2 to 4 in. high, very slender; leaves 1 to 2 lines long, ovate-oblong; flowers shortly pediceled or sessile, the branches of the cyme mostly 2 or 3; sepals minute, triangular; petals linear-oblong, acute, 1 to $1\frac{1}{2}$ lines long; follicles short, filled by the single seed.

Upper Sacramento Valley (Sierra Foothills and the Marysville Buttes); low hills bordering Napa Valley on the east, *Jepson*, Apr., 1893.

3. COTYLEDON L.

Stout perennial herbs; leaves very thick and fleshy, the basal ones in a conspicuous rosette; leaves of the flowering stems mostly bract-like, narrowly lanceolate, or the upper broader and shorter, all commonly with inversely triangular clasping base. Flowers large for the group, yellow or reddish, disposed in long racemes or secund cymes. Petals more or less united at base. Follicles erect or suberect. In appearance very similar to *Sedum*. Species difficult to elucidate, the types not known to us and the existing diagnoses unsatisfactory. The descriptions which follow have been derived from fresh material and from herbarium specimens which have been segregated into forms and the current names (with one exception) employed, with as much judgment as was possible under the circumstances, for their designation. (Greek *kotule*, a shallow cup, the leaves cup-like in some species.)

Cyme more or less flat-topped; leaves broad.

Petals oblong-ovate or oblong, acute; pedicels 1 or 2 lines long.

1. *C. farinosa*.

Petals oblong-lanceolate or lanceolate, acute; pedicels unequal, 2 to 6 lines long or more.

Petals indistinctly winged on the back; cyme loose, often contorted; plant in age straw-colored 2. *C. cæspitosa*.

Petals distinctly winged on back; cyme compact; plant reddish 3. *C. Plattiana*.

Cyme with 2 to 4 racemose divisions, or the branches more elongated, more or less re-branched, and paniculate; pedicels mostly 1 to 2 lines long 4. *C. laxa*.

1. *C. farinosa* Baker. Acaulescent; usually densely mealy, 5 to 8 in. high; leaves oblong-lanceolate, acuminate, the larger ones of the rosette 2 to 3 in. long; cauline leaves bract-like, broadly lanceolate, 1 in. long or less, the upper very short; cyme rather flat and broad, or with several small supplementary branches below and thus disposed to be somewhat paniculate; pedicels 1 or 2 lines long; petals oblong-ovate or oblong, acute, $3\frac{1}{2}$ to 4 lines long.

Summit of Pacheco Peak, *Brewer*. Very closely allied to the next. Our descriptions of the two species, as well as those in the Botany of California by Dr. Watson, are too nearly congruous. More abundant material needed.

2. *C. cæspitosa* Haw. Acaulescent, the short caudex $1\frac{1}{2}$ in. thick or less, with reddish flesh; herbage glabrous, the younger leaves in the center of rosette glaucous, the stems and inflorescence disposed to become straw-yellow in age; rosulate leaves 2 to $5\frac{1}{2}$ in. long, either narrowly oblong (6 to 9 lines broad) or strongly dilated above ($1\frac{1}{2}$ in. broad), all with conspicuously acuminate or lanceolate-acuminate apex; cauline leaves narrowly lanceolate and bract-like, $1\frac{1}{2}$ in. long or less, the upper very short and triangular; cyme compound, rather loose and sometimes few-flowered, $1\frac{1}{2}$ to 3 in. high, the whole inflorescence or one side frequently flexuous- or recurved-contorted; pedicels 2 to 6 or even 12 lines long; calyx-lobes ovate, acute, nearly 2 lines long; petals orange or yellow, oblong-lanceolate, 4 to 6 lines long, indistinctly winged on the back, fleshy in anthesis, afterwards becoming thin and scarious.

Rocky ridges of the Coast Ranges: Vaca Mountains, *Platt*; Howell Mountain, *Jepson*. Last of Apr.—June.

Var. *paniculata*. Cymes paniculate, the flowering stems bearing several peduncled cymes from the middle.—Morrison Cañon near Niles, collected by the author in 1897.

3. *C. Plattiana*. Acaulescent, 3 to 8 in. high; leaves more or less glaucous, the whole plant, including the inflorescence, becoming reddish; rosulate leaves 1 to 3 in. long, much like those of the preceding; cyme with numerous flowers, very compact and flat-topped, about $1\frac{1}{2}$ to $2\frac{1}{2}$ in. broad, about $1\frac{1}{4}$ to $1\frac{3}{4}$ in. high; pedicels 2 to 5 lines long; sepals triangular, acute or shortly acuminate, $1\frac{1}{2}$ lines long; petals broadly lanceolate, distinctly winged on the back, 4 lines long.

Inner Coast Range: Mt. Diablo; Vaca Mountains, *R. H. Platt*.

4. *C. laxa* Brew. & Wats. Nearly acaulescent, very glaucous; flowering branches stout, 1 to 2 ft. high; rosulate leaves lanceolate, sharply acuminate, 3 to 4 in. long or more; inflorescence of 2 to 4 simple secund racemes 3 to 5 in. long; pedicels 1 to 2 (or 3) lines long; sepals ovate, acute, 2 to $2\frac{1}{2}$ lines long; petals orange-yellow in early anthesis, oblong-lanceolate, acute or acuminate, distinctly keeled, 5 to 7 lines long.

Gabilan Range (San Juan), *Brewer*, thence southward to Southern California.

Var. *Setchellii*. Herbage merely glaucous; flowering branches slender, 9 to 12 in. high; leaves lanceolate or linear-lanceolate and long-acuminate; petals narrowly oblong, acute; racemes many, elongated and paniculate.—Coyote Creek, Santa Clara Co., 1896. *Setchell* and *Jepson*.

61. SAXIFRAGACEÆ. SAXIFRAGE FAMILY.

Ours perennial herbs or shrubs with alternate leaves (opposite in *Whipplea*) and no stipules (except in *Ribes*). Flowers perfect, peri-

gynous. Calyx 5-lobed or -cleft. Petals 5. Stamens in ours definite, 5 or 10 (or sometimes variable in *Whipplea*). Ovary superior or more or less adherent to the calyx, 2 to 5 (or 7)-celled, the stigmas as many as the cells or placentæ, the latter either parietal or axile. Fruit a capsule, follicle, or berry.

Herbs; fruit a capsule or follicle; leaves alternate.

Ovary 2 (or 3)-celled with axile placentæ, or of 2 or 3 nearly distinct carpels; petals 5.

Stamens 10 1. *SAXIFRAGA*.

Stamens 5 2. *BOYKINIA*.

Ovary 1-celled, with 2 or 3 parietal placentæ alternate with the styles or stigmas.

Stamens 10, not exserted; petals mostly cleft or toothed; styles 2 or 3, very short 3. *TELLIMA*.

Stamens 10, filiform, exserted, as also the 2 styles; petals inconspicuous, almost filiform 4. *TIARELLA*.

Stamens 5; styles 2, little exserted; petals entire, small 5. *HEUCHERA*.

Ovary 1-celled with 3 or 4 parietal placentæ opposite as many sessile stigmas; cluster of united sterile filaments alternate with the stamens, *i. e.*, at the base of the petals; sepals, petals and fertile stamens 5; flower solitary on a scape-like penduncle, showy 6. *PARNASSIA*.

Low trailing shrub; leaves opposite; stamens mostly 10; ovary about $\frac{3}{8}$ free, 3 to 5-celled, becoming a capsule 7. *WHIPPLEA*.

Shrubs; leaves alternate; stamens 5 or 4; ovary wholly inferior, 1-celled, in fruit a berry 8. *RIEBS*.

1. *SAXIFRAGA* L. SAXIFRAGE.

Perennial herbs, with the radical leaves clustered, either acaulescent or short-stemmed. Calyx either free from or cohering with the base of the ovary, 5-cleft or -parted. Petals 5, entire, deciduous. Stamens 10. Styles 2. Capsule 2-beaked, 2-celled, opening down or between the beaks, or sometimes the fruit consists of 2 nearly separate follicles. Seeds numerous. (Latin *saxum*, a rock, and *frango*, to break.)

Leaves not cordate, longer than petiole; filaments usually not dilated; var. *Californica* of 1. *S. Virginensis*.

Leaves cordate, the petiole commonly 1 to 3 times as long; filaments dilated toward apex 2. *S. Mertensiana*.

1. *S. Virginensis* Michx. var. *Californica*. Acaulescent; pubescent with scattered hairs, those toward summit of scape distinctly gland-tipped; leaves elliptic, rather coarsely serrate, somewhat undulate, $\frac{1}{2}$ to 2 in. long, longer than the broad petiole or nearly sessile; flowers white; lobes of the calyx ovate, reflexed; petals orbicular or often emarginate, $1\frac{1}{2}$ lines long; anthers red, filaments not dilated; ovary half coherent with the calyx, the 2 carpels almost distinct.—(*S. Californica* Greene.)

Hill country, mostly in the neighborhood of rocky places: Coast Ranges and Sierras. Mar.—Apr.

2. *S. Mertensiana* Bong. Acaulescent, villous-hirsute, the hairs tipped with red glands; leaves orbicular-cordate, $\frac{1}{2}$ to $3\frac{1}{2}$ in. broad, crenately toothed or shallowly incised; petioles long (1 to 7 in.); scape bearing a panicle of white flowers with lanceolate bracts; calyx segments nearly distinct; petals ovate-oblong, 2 lines long; anthers

carmine-colored; filaments dilated toward the summit; ovary very slightly united to the calyx, the carpels almost wholly united.

Woods of the Coast Ranges: Austin Creek, Sonoma Co.; Ukiah and northward. Apr. Panicle often bearing bulblets along the sides of its branches.

S. PELTATA Torr. is a remarkable species of the Sierras and Yalho Bally Mountains, growing along swiftly flowing mountain streams; it has peltate leaves 1 to 3½ ft. high and blades 1 to 2 ft. in diameter. *S. BRYOPHORA* Gray, of the High Sierras, is 4 to 5 in. high, with the scape branching into a very slender panicle; leaves linear-oblong, acute, 3 to 7 lines long; petals 2-spotted toward the base. The two preceding are acaulescent. *S. TOLMIEI* T. & G., of the High Sierras, has short leafy stems thickly covered with small evergreen sessile leaves, and a few-flowered scape-like peduncle.

2. *BOYKINIA* Nutt.

Perennial herbs with creeping rootstocks. Stems simple, bearing alternate leaves and paniculate or corymbose cymes of white flowers. Calyx-tube turbinate or subglobose or ovate, adherent to the 2-celled 2-beaked capsule. Petals entire, with a short claw, deciduous. Stamens 5, short. (In memory of Dr. Boykin of Georgia.)

1. *B. elata* (Nutt.) Greene. Erect, 2 ft. high or less, commonly glandular-pubescent, the bases of the slender stems often clothed with rusty hairs; leaves thin-membranaceous, shallowly lobed or incised and serrate, 2 to 4 in. broad; petioles long, exstipulate, bearing at base some rusty bristles; inflorescence a panicle of secund racemes; flowers slightly irregular; calyx-lobes lanceolate-triangular; petals narrow.

Woods of the Coast Ranges; Sierras of Placer Co., *Carpenter*.

B. MAJOR Gray, of the Sierras, may be distinguished by its conspicuous foliaceous stipules, corymbose-cymose flowers, regular corolla and broad petals.

3. *TELLIMA* R. Br. STAR FLOWER.

Perennial herb with tuberous rootstocks. Stems simple, bearing a simple terminal raceme of white, pink or red flowers. Leaves chiefly radical, their petioles with stipule-like dilations at the base. Calyx campanulate or turbinate; the lower part of the tube adherent to the base or lower half of the ovary. Petals inserted in the sinuses of the calyx, cleft or toothed, sometimes entire. Stamens 10, included. Ovary 1-celled, with 2 or 3 parietal placentæ and 2 or 3 very short styles. Capsule conical. Seeds numerous. (Name an anagram of *Mitella*.)

Styles and placentæ commonly 3; petals clawed, cleft or entire, usually white, sometimes rose-tinted.

Calyx-tube turbinate, the lower half of the ovary adherent

1. *T. affinis*.

Calyx truncate or rounded at base, the ovary almost wholly free

2. *T. heterophylla*.

Styles and placentæ commonly 2; petals greenish, changing to pink or red, sessile by a broad base, lacinate-pinnatifid 3. *T. grandiflora*.

1. **T. affinis** Gray Boland. "STAR OF BETHLEHEM." Stems 9 to 16 in. high, hispidulous, the hairs spreading and glandular; radical leaves roundish in outline and crenately lobed, varying into the cauline; cauline mostly parted into 3 broad divisions which are deeply incised or merely toothed; pedicels about equaling the turbinate calyx; raceme 7 to 10-flowered; petals mostly 3-toothed at apex, the central lobe rather larger; ovary half inferior, the styles and placentæ commonly 3, as also in the next.

Common in mostly open ground from San Bernardino northward throughout the state. Mar.-Apr.

2. **T. heterophylla** H. & A. Herbage hirsute- or somewhat scabrous-pubescent; stems 1 to 2 ft. high; radical leaves roundish, crenately lobed, $\frac{1}{2}$ to $1\frac{1}{4}$ in. broad, the cauline very variable but mostly 3-parted with the divisions incised or toothed; calyx campanulate, truncate or rounded at base; petals with a stout tooth on each side.

Shady ground, rather common; Coast Ranges. Apr. Var. **BOLANDERI** (T. Bolanderi (Gray) Boland.); petals entire or rarely with a small lateral tooth on each side.

3. **T. grandiflora** (Dougl.) Pursh. FALSE ALUM ROOT. Hirsute with spreading hairs, especially the stems and petioles, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; leaves roundish in outline, cordate at base, shallowly 3 to 5-lobed, serrate or crenate, 2 to 4 in. broad, the radical on petioles 2 to 9 in. long; raceme elongated, many-flowered; pedicels shorter than the ($3\frac{1}{2}$ lines long) flowers; calyx 10-nerved, inflated-campanulate, 4 to 5 lines long, enclosing and adherent to the lower $\frac{1}{4}$ of the capsule; petals at first greenish white, changing to pink or red, the upper portion laciniately cleft into subulate segments, the lower portion toothed; filaments scarcely as long as the anthers; ovary with 2 parietal placentæ alternate with as many styles.

Woods from Santa Cruz, San Francisco, Oakland Hills, and Alameda northward. One of the plants which follows very closely the distribution of the Redwood. Apr.-May. Sometimes called Fringe-cups.

4. **TIARELLA** L. FALSE MITRE-WORT.

Perennial herbs with white flowers in a terminal raceme or panicle. Calyx almost free from the ovary, its lobes ovate, more or less colored. Petals small, with short claws. Stamens 10, long and slender. Ovary 1-celled, compressed, 2-horned, the horns tapering into the long filiform styles. Capsule membranaceous, early dehiscent; valves unequal, one becoming elongated, the other remaining short. Seeds few at the base of each parietal placenta. (Diminutive of the Greek tiara, a high cap, in allusion to the pistil.)

1. **T. unifoliata** Hook. Stems sparingly leafy, usually several from the base, $\frac{3}{4}$ to 2 ft. high; leaves roundish or somewhat ovate in outline, 3 to 5-lobed, cordate at base, $1\frac{1}{2}$ to 4 in. broad, the lobes crenate; cauline leaves 2 or 3; radical leaves long-petioled (3 to 9 in.); panicle 3 to 9 in. long; petals almost filiform, inconspicuous.

Shaded ravines and cañons near the coast: Santa Cruz Mountains; Mendocino Co. and northward.

5. HEUCHERA L. ALUM ROOT.

Perennial herbs with stout rootstocks. Leaves radical, rounded, cordate and lobed. Flowering stems scape-like, or with 1 to 3 leaves, bearing an open or condensed panicle of small flowers in cymose clusters. Calyx campanulate or somewhat turbinate, its tube adnate to the lower $\frac{1}{2}$ of the ovary. Petals 5, very small or wanting, when present inserted on the throat of the calyx, clawed and entire. Stamens 5, ours with slender filaments. Capsule 1-celled with 2 parietal placentæ, dehiscent between the 2 beaks. (J. H. Heucher, 1677-1747, German Professor of Medicine.)

Cymes loose, the pedicels longer than the flowers; calyx turbinate at base.

1. *H. micrantha*.

Cymes close, the pedicels shorter than the flowers; calyx rounded at base.

2. *H. pilosissima*.

1. *H. micrantha* Dougl. Flowering stems 1 to 3 ft. high; petioles and stems pilose-hirsute, the leaves hirsutulous and the inflorescence glandular-puberulent; leaves round- or ovate-cordate, 2 to 4 in. long, obtusely lobed and crenate-toothed, on petioles as much as 10 in. long; flowers in an ample loose panicle; calyx 1 line long, shorter than the slender pedicels; petals, stamens and styles exserted; petals narrowly oblong, rather shorter than the calyx.

Monterey and northward, common in the Bay Region, especially toward the coast; not collected in the inner Coast Ranges. Found in the Sierra Nevada. May-June.

2. *H. pilosissima* F. & M. Very glandular villous, 1 to 2 ft. high; pedicels shorter than the flowers, these in close clusters and panicle less ample than in the preceding; calyx globular, $1\frac{1}{2}$ to 2 $\frac{1}{2}$ lines long; petals, filaments and style little exserted.

Near the coast from Monterey to Humboldt Co.

H. RUBESCENS Torr., of the Sierra Nevada, has leaves $1\frac{1}{2}$ or mostly 1 in. in diameter or less and an oblong-campanulate calyx commonly tinged with rose-purple.

6. PARNASSIA L. GRASS OF PARNASSUS.

Glabrous perennial herbs with entire leaves in a radical tuft. Flowers solitary, white, on scape-like stems, which commonly bear a single small sessile leaf. Sepals slightly united at base. Petals greenish- or yellowish-veined, each bearing at base a cluster of gland-tipped sterile filaments. Stamens 5, alternate with the petals. Ovary 1-celled; stigmas 4 (or 3), sessile, opposite the same number of placentæ. Capsule 3 or 4-valved, the valves placenta-bearing along their middle. Seed-coat loose, somewhat winged.

1. *P. palustris* L. var. *Californica* Gray. Scape 9 to 14 in. high; leaves elliptic, 1 to $1\frac{1}{2}$ in. long, contracted at base into a petiole which is short or twice as long as the blade; petals oval or obovate, 6 to 9 lines long; sterile filaments capillary, 20 to 24 in a set, united to the middle, each tipped with an antheroid protuberance.

Rare in the Bay Region: Loma Prieta (Santa Cruz Mountains) and Marin Co.; more common in the Sierra Nevada.

7. WHIPPLEA Torr.

Small and low under-shrub with opposite leaves and clusters of small white flowers on a terminal naked peduncle. Calyx-tube wholly adnate to the lower portion of the ovary which is about $\frac{2}{3}$ free. Stamens 10, rarely 8, 9, 11 or 12, those opposite the petals somewhat shorter, all dilated at the base or below the middle. Ovary 3 to 5-celled, with a single suspended ovule in each cell; styles distinct, subulate; stigmas introrse. Capsule septicidally dehiscent into 3 to 5 cartilaginous 1-seeded portions which open down the ventral suture. (Dedicated to Lieutenant A. W. Whipple, commander of the Pacific Railroad Expedition from the Mississippi River to Los Angeles in 1853 and 1854.)

1. *W. modesta* Torr. Stems slender, diffuse or trailing; branchlets, peduncles and calyx-tube pubescent; calyx-lobes glabrous; foliage with scattered hairs, on the older leaves often pustulate-dilated at base; leaves $\frac{3}{4}$ to $1\frac{1}{4}$ or rarely $1\frac{3}{4}$ in. long, ovate or oval-ovate, 3-nerved from the base, crenate above the middle, short-petioled; clusters mostly 4 to 9-flowered, the flowers soon becoming somewhat greenish; petals oblong or ovate, contracted at base, exceeding 1 line, larger than the linear calyx-lobes; capsule globular; styles deciduous.

Thickets or woods of the Coast Ranges from Monterey to Mendocino Cos. and eastward to Mt. St. Helena, *F. P. McLean*, 1872, and Miller Cañon of the Vaca Mountains, *Jepson*, 1885. Mar.-Apr. First collected in Marin Co. by Dr. J. M. Bigelow, the botanist of Whipple's Expedition.

8. RIBES L. GOOSEBERRY. CURRANT.

Shrubs, either unarmed or prickly. Leaves alternate, palmately lobed, the stipules adnate or none. Flowers in racemes or solitary, the pedicels bracteolate. Calyx-lobes, petals and stamens 5 in all the Californian species except *R. speciosum*. Calyx-tube adnate to the 1-celled ovary and more or less produced beyond it. Petals inserted on the throat of the calyx, the stamens alternating with them. Placentæ 2, parietal. Styles 2, distinct or more or less united; stigma terminal. Fruit a berry. (Ancient Arabic name.)

Thornless and without prickles; raceme many-flowered (except no. 1); berry unarmed, rarely glandular-bristly.—CURRANTS.

Leaves convolute in the bud; flowers bright yellow; calyx-tube salverform; var. *tenuiflorum* of 1. *R. aureum*.

Leaves plaited in the bud; flowers rose-red varying to white.

Leaves thin, glabrous or nearly so; var. *glutiniosum* of 2. *R. sanguineum*.

Leaves thick, very rugulose, more or less white-tomentose beneath 3. *R. malvaceum*.

Thorny and often prickly; leaves plaited in the bud; raceme 1 to 4-flowered. —GOOSEBERRIES.

Petals plane, fan-shaped; anthers obtuse and pointless; styles long-villous; berry glabrous 4. *R. divaricatum*.

Petals involute; anthers sagittate, mucronate-tipped; styles glabrous; berry prickly.

Calyx greenish white 5. *R. Victoris*.

Calyx greenish, glabrous exteriorly; soft bristles of the ovary non-glandular 6. *R. Californicum*.

Calyx purplish, glandular-pubescent exteriorly; hairs of the ovary capitate-glandular 7. *R. Menziesii*.

1. ***R. aureum*** Pursh var. ***tenuiflorum***. Shrub 4 to 8 ft. high, nearly glabrous, not glandular; leaves 3 to 5-lobed, obtuse or truncate at base, the lobes few-toothed or incised; racemes about 1 in. long, loose, with few to several flowers, the bracts foliaceous and conspicuous; flowers golden yellow; calyx-tube salverform, 3 to 4 times the length of the oval lobes; berry yellowish, 2 lines long.—(*R. tenuiflorum* Lindl.)

Wild-cat Creek, acc. to Behr, and southward in the Oakland Hills; also in the Sierra Nevada.

2. ***R. sanguineum*** Pursh var. ***glutinosum*** Brew. & Wats. FLOWERING CURRANT. Erect or spreading shrub, 5 to 8 or 9 ft. high; bark brownish, shreddy; herbage glandular; leaves thin, orbicular-cordate in outline, 1 to 1½ in. broad, the lobes shallow and rather finely serrate; petioles 1 to 1½ in. long; racemes 1 to 2 in. long, the bracts colored; flowers rose-color, 5 lines long; pedicels 3 lines long, with 2 bractlets at apex; calyx reddish, the lobes elliptic, spreading; petals obovate, 1½ lines long, white, changing to deep red; stamens and style not surpassing the petals; berries blue-black, with bloom, 4 lines in diameter.—(*R. glutinosum* Benth.)

Common near the coast in cañons or on northward slopes. Jan.—Mar.

3. ***R. malvaceum*** Smith. Similar to the preceding but with stouter branches and commonly more strictly erect and compact, 4 to 6 ft. high; leaves thick, conspicuously rugulose, slightly scabrous above, more or less white-tomentose beneath; flowers rose-color or very pale pink; berry glaucous, somewhat hispidulous or hairy, the pulp soft and sweet.

Open hills about Berkeley or in deep cañons of the Vaca Mountains. Dec.—Jan., fruiting as early as Mar. Mr. H. A. Dutton, of Stanford University, notes that the racemes of this are usually erect, while those of *R. sanguineum* are drooping.

4. ***R. divaricatum*** Dougl. STRAGGLY GOOSEBERRY. Four to 6 ft. high, with long straggling branches; bark dull gray; herbage glandular when young; subaxillary spines 3 or more often 1; leaves roundish, palmately 3 to 5-cleft, the divisions incised or crenately toothed; petioles shorter or longer than the blades; racemes drooping; pedicels slender, ½ in. long, with a small roundish bract at base; flowers 5 lines long; sepals broadly oblong, obtuse, 2 lines long, green without, dull purple within; petals white, fan-shaped, plane, less than 1 line long; stamens and style long-exserted, the latter deeply cleft, long-villous at the middle.

Common in shaded cañons and flats from Southern California northward, mostly near the coast: San Francisco; Oakland Hills; Marin Co. Feb.

5. ***R. Victoris*** Greene. VICTOR'S GOOSEBERRY. Low bush,

1½ to 2 ft. high, the branches of the season or preceding season with soft prickles and weak spines, the older branches unarmed and with gray-brown bark; young herbage hirsutulous and very viscid-glandular; leaves ½ to 1¼ in. long, crenately incised, distinctly 5-lobed, the lower pair much smaller; flowers 8 lines long, on long (1 to 1¼ in.) slender pedicels which bear an ovate bract 1 line long close below the flower, or the bracts 2 and the flowers as many; sepals dull white; petals clear white, similar to no. 7; filaments stoutish, much surpassing the petals; fruit golden yellow, 7 or 8 lines in diameter, densely covered with slender prickles.

Marin Co., *Chesnut*; near Sonoma; inner North Coast Ranges (Vaca Mountains), where it is the only Gooseberry, so far as known. Mar.

6. **R. Californicum** H. & A. HILLSIDE GOOSEBERRY. Compact shrub, with more or less flexuous branches, 2½ to 4 ft. high; leaves at flowering time mostly ½ to ¾ in. broad, the entire upper surface glandular-shining; flowers solitary (sometimes 2), 5 lines long; pedicels with a couple of shallowly lobed bracts at middle; calyx greenish, purplish-tinged, glabrous; petals white, and convolute as in no. 7; ovary covered with soft bristles interspersed with short gland-tipped hairs.

Dry exposed slopes of the Berkeley Hills. Feb.-Mar. To be distinguished from the preceding by its greenish calyx which is glabrous externally and by the soft non-glandular bristles of the ovary. Doubtless not worthy of full specific rank.

7. **R. Menziesii** Pursh. CAÑON GOOSEBERRY. Tall openly branched shrub, 4 to 8 ft. high; stems with mostly 3 strong spines at the nodes and also more or less prickly, especially on the sterile shoots; pedicels 1 or 2-flowered, the bractlet rather near the flower; flowers ½ in. long; exterior of calyx more or less glandular-pubescent, its lobes lurid-purple, 3 lines long, closely reflexed; petals white, waxy, involute from each edge, truncate and often minutely crenulate-toothed at apex, 2 lines long, the stamens nearly twice as long; style exceeding the stamens, 2-cleft at apex; ovary covered with short hairs, the hairs capitate-glandular.—(R. subvestitum H. & A.)

Outer Coast Ranges of Middle California. The flowers appear in Jan. or Feb. from winter buds, the scales of which are homologous to petioles.

62. PLATANACEÆ. PLANE-TREE FAMILY.

Large trees with alternate ample palmately lobed leaves and sheathing stipules; dilated base of petiole enclosing the bud of the next season; bark falling away in thin plates. Inflorescence consisting of spherical or head-like clusters distributed at intervals along a terminal very slender axis and thus appearing moniliform. Flowers monœcious, the staminate and the pistillate on separate axes. Calyx and corolla none. Stamens with long anthers and very short filaments densely crowded on a globose fleshy receptacle. Receptacle

of pistillate heads similar, the pistils with interspersed clavate truncate bracts; ovary 1-ovuled; style one, filiform, laterally stigmatic. Fruit a coriaceous nutlet with tawny hairs about the base. Seed orthotropous, pendulous.

1. **PLATANUS** L. PLANE TREE.

The only genus. (Greek *platus*, broad, referring to the ample leaves.)

1. **P. racemosa** Nutt. SYCAMORE. Widely branching, 50 to 80 ft. high; leaves stellate-pubescent when young, broader than long, 5 to 6 in. broad, mostly 5-lobed, at base truncate or subcordate; lobes acute, the lower pair smaller; margin entire, save for the remote small and blunt cusps terminating the main veins; pistillate heads 3 to 5; staminate heads several.

Common tree along all large interior streams, ranging from the Sacramento and San Joaquin Rivers westward through the Mt. Diablo Range to the eastern slope of Bald Peak near Berkeley, Alameda Creek near Niles, Los Gatos Creek, Carnadero Creek near Gilroy and southward through the Coast Ranges to Southern California. Not in the North Coast Ranges so far as known to us. Mar.

63. **ROSACEÆ.** ROSE FAMILY.

Herbs, shrubs, or trees. Leaves alternate, toothed or divided, ours with stipules. Flowers solitary or in spikes, racemes, or cymes. Calyx 5 (or 4)-lobed. Petals 5, rarely none. Stamens 10 to numerous, usually indefinite, inserted with the petals on the calyx below its lobes. Pistils 1 to many, distinct and free from the calyx, or united into a 2 to 5-celled ovary which is nearly or completely inferior. Fruit a follicle, an achene, a drupe, a cluster of drupelets (as in a blackberry), or a pome. Seeds with straight embryo; endosperm usually none. Calyx in certain genera appearing double by a row of bractlets borne at or near the sinuses.

A. Ovary superior.

Fruit dehiscent, consisting of 2 to 5 follicles; shrubs with simple leaves.—**SPIRÆÆ** (Meadow Sweet Tribe).

Follicles dehiscent by both sutures, several-seeded; flowers in corymbs. .

1. **OPULASTER.**

Follicles dehiscent by the dorsal suture or indehiscent, 1-seeded; flowers in panicles

2. **HOLODISCUS.**

Fruit indehiscent, consisting of 1 to many achenes or composed of drupelets and styled a "berry."—**ROSEÆ** (Rose Tribe).

Shrubs.

Leaves simple; pistil 1, becoming an achene.

Petals white; leaves linear and rigid; achene not tailed

3. **ADENOSTOMA.**

Petals none; leaves broadly obovate; achene with long plumose tail..

4. **CERCOCARPUS.**

Leaves pinnately compound; pistils many, disposed on the inside of a globose or urn-shaped calyx-tube which is lined by the receptacle and in fruit termed a "hip;" stems prickly

5. **ROSA.**

Leaves simple or compound; pistils many on a convex receptacle, becoming drupelets which are coherent and form the fruit called a "berry"

6. **RUBUS.**

Herbs.

Perennials.

Pistils many on a convex receptacle, becoming achenes; calyx with a row of bractlets alternating with the sepals.

Receptacle fleshy; leaves 3-foliolate 7. FRAGARIA.

Receptacle dry; leaves digitate or pinnate 8. POTENTILLA.

Pistil 1; leaves pinnate.

Petals yellow; prickles of calyx hooked at tip 9. AGRIMONIA.

Petals none; prickles of calyx straight, but retrorsely barbed 10. ACENA.

Annuals; diminutive plants, with palmately divided leaves; petals none; pistil (in ours) 1, becoming an achene 11. ALCHEMILLA.

Trees or shrubs with simple leaves and early-falling stipules; fruit a drupe. —DRUPEÆ (Cherry Tribe).

Flowers dioecious; pistils 5; drupes 1 to 4 12. OSMARONIA.

Flowers perfect; drupe solitary.

Leaves conduplicate in the bud; drupe without bloom; stone spherical.

13. CERASUS.

Leaves convolute in the bud; drupe with bloom; stone compressed 14. PRUNUS.

B. Ovary inferior.

Trees and shrubs with simple leaves and free stipules; fruit a pome, consisting of a 2 to 5-celled ovary which is enclosed in and mostly adherent to the fleshy calyx-tube.—POMEÆ (Apple Tribe).

Leaves evergreen, coriaceous; flowers small, numerous in a corymbose panicle; fruit bright red, the 2 carpels enclosed in the berry-like calyx 15. HETEROMELES.

Leaves deciduous.

Flowers in corymbs; ovary 2 to 5-celled.

Pome drupe-like, containing 2 to 5 bony stones, either separable or united into one; branches bearing thorns 16. CRATÆGUS.

Pome containing 2 to 5 papery or cartilaginous carpels, each 2-seeded 17. MALUS.

Flowers in racemes, showy; ovary 5-celled, each cell in fruit becoming 2-celled by a partition from the back 18. AMELANCHIER.

1. OPULASTER Medic. NINE BARK.

Diffuse shrubs with reddish brown shreddy bark. Leaves simple; stipules deciduous. Flowers white, in corymbs terminating lateral leafy branchlets. Calyx campanulate, 5-cleft, persistent. Petals 5, rounded, equal. Stamens 20 to 24. Pistils 1 to 5, mostly 3, somewhat united toward the base, becoming as many inflated 2 to 4-seeded follicles dehiscent along both sutures. Seeds crustaceous, shining, with copious endosperm.—(Opulus, ancient Latin name of a kind of maple tree, and aster, a suffix meaning wild.)

1. *O. opulifolius* (L.) Kuntze var. *capitatus*. Three to 5 ft. high or often with sucker-like stems nearly twice as long, commonly forming with other shrubs and with climbers a dense tangle; leaves roundish or ovate, 3-lobed and irregularly serrate, glabrous or scabrous above, stellate-pubescent beneath, 1 to 2 in. long, on petioles $\frac{1}{2}$ in. long or more; leaves of sterile shoots similar but larger; pedicels and calyx pubescent; corymbs hemispherical, $\frac{3}{4}$ to 1 in. high; petals $1\frac{1}{2}$ lines long; stamens alternately long and short; pods divergent, commonly 3 to 4 lines long, splitting into 2 valves.—(*Neillia capitata* Greene.)

Common along streams in the hills, often gregarious on steep north hillsides: Oakland Hills; Marin Co.; Napa Valley and northward; apparently not occurring in the inner North Coast or Mt. Diablo

Ranges, but found in the Sierra Nevada. Apr. Winter buds narrowly oblong, acute, $\frac{1}{2}$ in. long, the scales homologous with petioles. The sucker-like growths of a single year sometimes attain a length of 8 ft.

2. HOLODISCUS Maxim.

Deciduous shrubs with toothed or lobed leaves and no stipules. Flowers creamy-white, small, numerous in terminal panicles. Calyx persistent, 5-cleft. Stamens 20, on a ring-like perigynous disk. Petals 5, rounded. Pistils 5, distinct, alternate with the calyx-lobes. Follicles hairy, 1-seeded, tardily dehiscent or indehiscent. (Greek *holo*, whole or complete, and *diskos*, a disk.)

1. *H. discolor* (Pursh) Maxim. var. *ariæfolius* (Wats). CALIFORNIA MEADOW SWEET. Shrub, 3 to 6 ft. high; leaves ovate to ovate-elliptic in outline, green above, whitish beneath with soft hairs, coarsely serrate or incised above the entire truncate or broadly cuneate base, $\frac{3}{4}$ to 3 in. long, on petioles 2 to 6 lines long; panicle ample, 3 to 8 in. long, often half drooping in anthesis; flowers $1\frac{1}{2}$ lines long; follicles about 1 line long.—(*Spiræa ariæfolia* Smith.)

Common in wooded cañons of the Coast Range hills.

3. ADENOSTOMA H. & A.

Evergreen shrubs with somewhat resinous herbage. Leaves linear, rigid, entire, small, numerous and mostly fascicled. Flowers small, white, disposed in a terminal and rather close pyramidal panicle, the branches of which are racemose. Calyx obconical, 5-lobed, 10-ribbed, with small bracts at base, the orifice bearing 5 glands. Petals 5. Stamens 10 to 15, inserted 2 or 3 together, alternate with the petals. Pistil 1, simple; ovary obovoid, 1-celled; ovules 1 or 2, suspended; style lateral, curved, with an obliquely dilated stigma. Fruit an achene, covered by the indurated calyx-tube. (Greek *aden*, gland, and *stoma*, mouth, in allusion to the calyx.)

1. *A. fasciculatum* H. & A. CHAMISAL. Bush, 2 to 10 ft. high, with virgate branches clothed with leaf-fascicles; leaves linear or rather broader towards the apex, 3 to 5 lines long; stipules small, acute; flowers crowded, sessile; calyx 1 line long; petals orbicular, spreading.

The most abundant and characteristic bush of the higher Coast Ranges, commonly gregarious and occupying (to the exclusion of other shrubs) extensive slopes and mountain ridges, such vegetation known to mountaineers as "Chamisal," "Chamiso" or "Grease-wood." It often forms a distinct zone, as in the Sierras, between the foothills and the Yellow Pine belt. June. The leaves of seedlings are pinnately dissected into 3 to 5 lobes.

4. CERCOCARPUS HBK.

Shrubs or low trees with simple leaves. Flowers from winter buds, solitary or fascicled, terminal on the short branchlets. Calyx consisting of a slender pedicel-like tube surmounted by the low hemispherical

(or broadly campanulate) limb; limb with broad short triangular teeth, the whole limb deciduous. Petals none. Stamens numerous, borne in 2 or 3 rows on the calyx. Pistil one, with a single long style and terminal stigma; ovule solitary, ascending. Fruit a terete villous achene enclosed in the elongated calyx-tube and surmounted by the very much elongated twisted soft-hairy style. (Greek *kerkis*, a shuttle, and *karpós*, a fruit, in reference to the achene and its twisted tail.)

1. **C. betulæfolius** Nutt. MOUNTAIN MAHOGANY. Shrub or small tree, 6 to 14 ft. high, the stem with a gray thin flaky bark; branches spreading or recurving; leaves subcoriaceous, broadly obovate, serrate above the middle, cuncate and entire towards the base, conspicuously feather-veined, dark green and shining above, pubescent beneath; calyx-limb open campanulate, 3 lines broad, the tube in fruit becoming $\frac{1}{2}$ in. long, of a reddish brown color, somewhat contracted above; stamens 25 to 60; achene coriaceous, the hairy style 3 in. long or less.

Common in the Coast Ranges, mostly at middle or high elevations, from the Yal-lo Bally Mountains southward. Flowering in Mar., but more conspicuous in late summer on account of the long feathery tails of the fruit.

5. **ROSA** L. ROSE.

Shrubby prickly plants with odd-pinnate leaves and adnate stipules. Flowers large, ours mostly pink, solitary or corymbose. Calyx-tube globose or urn-shaped, becoming fleshy in fruit; calyx-limb 5-parted. Bractlets none. Petals 5 (rarely 6, 7 or 8), rounded, spreading, inserted with the numerous stamens on the edge of the thin disk which lines the calyx-tube and bears within and toward the base the numerous distinct pistils. Ovaries hairy, becoming bony achenes. Achenes enclosed in the globose or urn-shaped calyx-tube, which is popularly termed a "hip." (The Latin name.)

Flowers solitary, or 2 or 3 in a cluster; calyx-lobes deciduous from the fruit.

Flowers few to many in a corymb; calyx-lobes persistent in fruit.

Calyx-lobes soft-pubescent outside; plants 3 to 5 ft. high or more

Calyx-lobes glandular-hispid outside: var. *Sonomensis* of 3. *R. spithamea*.

1. **R. gymnocarpa** Nutt. WOOD ROSE. Slender, 1 to 3 ft. high, glabrous, the branchlets and rachis of the leaves armed with long slender straight prickles, or sometimes nearly unarmed; leaves 2 or 3 in. long; leaflets 3 or commonly 5, elliptic or roundish, 3 to 9 lines long, doubly serrate, the minute teeth gland-tipped; flowers generally solitary or in clusters of 2 or 3; corolla 7 to 10 lines broad; pedicels glabrous or more frequently clothed with gland-tipped hairs; calyx-lobes at length deciduous; hips ovate or pear-shaped, red, 4 to 7 lines long.

Shady woods or among bushes on north slopes in the hills, or often near streams.

2. **R. Californica** C. & S. CALIFORNIA WILD ROSE. Erect,

branching shrub 3 to 5 ft. high or more; prickles few, stout, recurved, mostly in pairs below the leaves; leaves pubescent, especially on the lower surface; leaflets 5 or commonly 7, ovate to elliptic, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; flowers in terminal corymbs, 1 to $1\frac{1}{4}$ in. broad; pedicels glandular-pubescent; hips globose, 4 to 6 lines broad, somewhat constricted below the calyx-lobes.

Common everywhere along river and creek banks throughout California, often forming small thickets. Flowering most freely in June, the hips ripe Aug.-Oct.

3. *R. spithamæa* Wats. var. *Sonomensis*. SONOMA ROSE. Branches several from the base, erect, mostly simple, 9 to 12 in. high, densely armed with stout straight or slightly recurved prickles; leaflets 5, broadly ovate, 4 to 8 lines long, serrate, with the teeth minutely glandular-denticulate; flowers small, several in a corymb; hips globose, 3 to 5 lines broad; calyx-lobes ovate-lanceolate, glandular-hispid, rather closely erect in fruit.—(*R. Sonomensis* Greene.)

Rare montane species, on high dry slopes: Sonoma Co., *Greene*; Mt. Tamalpais, *Jepson*; Saratoga, Santa Clara Co., *Davy*. *R. SPITHAMÆA* Wats., Mountain Rose, is found in Trinity Co.

6. RUBUS L.

Ours shrubs, either erect or with long trailing or climbing prickly or unarmed stems and branches. Leaves simple, or pinnately compound with 3 to 5 leaflets. Calyx 5-parted, without bractlets. Petals 5. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming drupelets which are united to each other and form the aggregate fruit called a blackberry or raspberry. (Latin name, allied to *ruber*, red.)

Fruit conical or hemispherical, concave beneath, the drupelets parting from the receptacle as a whole when ripe.

Stems unarmed; leaves simple, palmately lobed: var. *velutinus* of
1. *R. parviflorus*.

Stems prickly; leaflets 3-foliolate.
Flowers red; leaves pubescent or silky beneath: var. *Menziesii* of
2. *R. spectabilis*.

Flowers white; leaves white-tomentose beneath 3. *R. leucodermis*.
Fruit oblong, the drupelets persistent upon the receptacle; leaves mostly 3 to 5-foliolate, a few simple; stems and leaves very prickly 4. *R. vitifolius*.

1. *R. parviflorus* Nutt. var. *velutinus* (Brewer) Greene. THIMBLE-BERRY. Commonly 3 or 4 ft. high; herbage hispid, the pubescence of the petioles and stems more or less glandular; leaves palmately 5-lobed, circular in outline, 3 to 7 in. broad, mucronate-serrate; petioles shorter than the blade; stipules lanceolate, deciduous; flowers about 4 to 7 in terminal corymbs, white (rarely pinkish), 1 to 3 in. broad, very variable in the number of sepals and petals; lobes of sepals ovate, terminated by a tail-like or sometimes foliaceous appendage often of nearly the same length; petals elliptic.

Common along cañon streams in the hill country near the coast: Monterey; Oakland Hills; Napa Mountains; Sonoma Co. and northward. May.

2. *R. spectabilis* Pursh var. *Menziesii* Wats. SALMON BERRY. Three to 9 ft. high, the stems with reddish brown bark and sparingly armed, or the canes (sterile shoots) very prickly; prickles short, straight; leaves 3-foliolate; leaflets ovate, doubly serrate, often more or less lobed, 1 to 2 in. long, lightly pubescent or silky beneath; flowers 1 to 3 in a cluster; petals red, 6 to 7 lines long; fruit large, ovoid, red or yellow, glabrous.

Margins of woods and along streams in the vicinity of the ocean: Marin Co. (common on Point Reyes) and northward. Apr.

3. *R. leucodermis* Dougl. RASPBERRY. Plants with very long and straggling branches, these and the petioles freely armed with short recurved prickles; herbage glaucous; leaves 3-foliolate; stipules setaceous; leaflets ovate to ovate-lanceolate, often unequal-sided at base, doubly serrate, $\frac{3}{4}$ to 2 in. long, pubescent but green above, white with a dense close tomentum below; flowers few, corymbose, white, 6 lines broad; sepals lanceolate, long-acuminate, exceeding the petals; fruit glaucous, of an agreeable flavor, either black or red.

Rarely collected within our limits: Santa Cruz Mountains; Sonoma Co. Frequent in northern California. Sierra Nevada.

4. *R. vitifolius* C. & S. COMMON BLACKBERRY. Stems a few ft. high, and more or less erect, or 8 to 18 ft. long and trailing over the ground or climbing over other shrubs; leaves pubescent or almost glabrous, all pinnately 3 to 5-foliolate, the leaflets ovate, doubly serrate, $\frac{3}{4}$ to $2\frac{1}{2}$ in. long, or sometimes a few upper leaves simple and ovate or palmately lobed; petals 8 or 9 lines long; fruit black, oblong, sweet.

Common along creeks and rivers in the valleys and among the hills of the Coast Range country and Sacramento and San Joaquin valleys.

7. FRAGARIA L. STRAWBERRY.

Perennial acaulescent herbs propagating by runners. Leaves tufted, 3-foliolate, with membranous stipules and cuneate-obovate serrate leaflets. Flowers white, borne in cymes on a naked scape. Calyx persistent, bearing 5 bractlets alternate with the calyx-lobes. Petals obovate, short-clawed. Pistils numerous, distinct, borne on an elevated convex receptacle; styles lateral. Fruit berry-like, formed of the enlarged succulent receptacle which bears the minute seed-like achenes. (Name in reference to the fragrance of the berry.)

Leaves thin, light green; achenes borne on the surface of the receptacle. . . .

Leaves thicker, dark green; achenes partly imbedded in the surface of the receptacle.

1. *F. Californica* C. & S. WOOD STRAWBERRY. Herbage pilose; leaflets thin, light green, 1 to $1\frac{1}{2}$ in. long; scapes 4 or 5 in. high, cymosely 2-flowered; sepals and bractlets laciniately 2 or 3-toothed or entire; petals orbicular with a small abruptly acute point at apex, or the margin near the apex slightly crimped, 3 to 4 lines long; fruit globose, about 4 lines in diameter, the achenes borne superficially.

1. *F. Californica*.

2. *F. Chilensis*.

Woods of the Coast Ranges, from upper Napa Valley southward. Not reported from the inner North Coast Ranges. Feb.-May.

2. F. Chilensis Duchesne. SAND STRAWBERRY. Runners rather stout; upper surface of leaves glabrous, the herbage otherwise densely pubescent with long weak hairs (especially the under surface of the leaves) and often, also, with a fine indument; leaves of firm texture, dark green, the leaflets $\frac{1}{2}$ to 1 in. long; scapes several-flowered, 1 to 4 in. high; flowers 1 in. in diameter, said by Greene to be dioecious; sepals entire; petals roundish, 4 to 6 lines long; receptacle with the achenes embedded in its surface.

Sandbanks and hills near the sea from San Francisco northward. Mar.-May.

8. POTENTILLA L. FIVE FINGER.

Perennial herbs (or some species of the High Sierras suffrutescent), with compound leaves and serrate or cleft leaflets. Flowers in ours white or yellow, in terminal cymes. Calyx saucer-shaped, campanulate, or cup-shaped, cleft into 5 lobes, with as many alternate bractlets at the sinuses. Petals orbicular to linear. Stamens 10 to many, the filaments filiform or variously dilated. Pistils many or numerous, borne upon an elevated receptacle, becoming in fruit small turgid crustaceous achenes; styles lateral or nearly terminal, deciduous. (Diminutive of the Latin *potens*, powerful, some species used medicinally.)

Stamens 10 to many; filaments filiform; petals yellow, obovate, not clawed. Stamens 10(?); leaves palmately 3-foliolate; stems erect or ascending . . .

2. *P. millegrana*.

Stamens 20 to 25; leaves pinnate,

White-silky beneath; creeping herb . . . 1. *P. Anserina*.

Green on both faces; stems erect. . . 3. *P. glandulosa*.

Stamens 10 in 2 rows, alternately long and short; filaments dilated throughout or at base only; petals white, obovate or linear, often clawed.

Cymes disposed to be lax; bractlets mostly as large as the calyx-lobes.

Herbage glandular-pubescent and green; bractlets entire or toothed.

Calyx short-campanulate; leaflets sharply toothed or sparingly incised; stems slender. . . 4. *P. multijuga*.

Calyx cup-shaped.

Leaflets toothed or incised at apex; stems stout. . . 5. *P. Californica*.

Leaflets incisely once or twice cleft; stems slender. . . 6. *P. elata*.

Herbage white-silky, glandless; bractlets entire. . . 7. *P. Kelloggii*.

Cymes more condensed; bractlets smaller than the calyx-lobes; stems sparingly leafy, the leaves mostly in a radical tuft.

Lobes of the leaflets obtuse; petals notched at apex. . . 8. *P. tenuiloba*.

Teeth or short lobes of the leaflets acute; petals entire. . . 9. *P. Bolanderi*.

1. **P. Anserina** L. GOOSE-GRASS. Root perennial, thick, bearing a tuft of leaves, stems and peduncles; stems slender, prostrate, rooting at each joint; flowers one to several, long-peduncled; leaves white-silky beneath, green above; leaflets 7 to 21, with smaller ones interposed, oblong, sharply serrate; bractlets about equaling the calyx-lobes; petals rounded, much exceeding the calyx; stamens 20 to 25; receptacle hairy.

Marshy or springy places along the seacoast (San Francisco, Marin Co. and elsewhere). Sierra Nevada. Apr.-Aug.

2. *P. millegrana* Engelm. Stems erect or ascending, leafy up to the inflorescence; leaves ternately 3-foliolate, the lower on long slender petioles; leaflets cuneate-obovate or roundish, serrate towards the apex, about $\frac{1}{2}$ in. long; stipules ovate-lanceolate, entire; flowers very numerous in lax cymes; stamens about 10; achenes white.—(*P. rivalis* var. *millegrana* Wats.)

Lower San Joaquin River.

3. *P. glandulosa* Lindl. Erect, 1 to 3 ft. high, glandular-pubescent above; radical leaves 4 to 8 or even 15 in. long; leaflets 5 or 7 (or those of the uppermost leaves 3), broadly ovate or obovate with cuneate base, 1 to 3 in. long; cyme lax, leafy-bracted; flowers small; the pale yellow obovoid petals scarcely equaling the calyx; stamens 25, in one row on the margin of the thickened disk; style attached below the middle of the ovary.

Wooded hills of the Coast Ranges: Vaca Mountains; Napa Valley hills; Oakland Hills; San Francisco Peninsula. Not reported from the inner Coast Ranges. Apr.—May. The var. *Nevadensis* Wats. occurs in the Sierras.

4. *P. multijuga* Lehm. Herbage glandular; stems erect, 1 ft. high, the leaves mostly at base; leaflets 17 to 23, or the terminal ones more or less confluent, roundish to cuneate-obovate, sharply toothed except at the very base, 5 to 6 lines long; calyx short-campanulate, the bractlets entire, smaller than the lobes; petals narrowly oblong, white, spreading; filaments subulate-dilated, the alternate little shorter.

Monterey to Santa Barbara; to be expected at Santa Cruz. Very doubtfully distinct from the next.

5. *P. Californica* (C. & S.) Greene. Stems stoutish, 1 to 2 ft. high; herbage glandular-pubescent; leaves mostly radical; leaflets thickish, 9 to 21 (or the upper leaves with fewer leaflets), cuneate-obovate to -oblong, toothed or incised at the apex, $\frac{1}{2}$ to 1 in. or less long; flowers solitary, or commonly in dense clusters in a cymose-dichotomous inflorescence; calyx cup-shaped, 4 to 6 lines high, about equaling the spatulate petals; bractlets exceeding the sepals, sometimes 3-toothed at the broad apex.—(*Horkelia Californica* C. & S.)

Wooded slopes of the San Francisco Peninsula and the Oakland Hills.

Var. *Carmeliana*. Stems slender, $1\frac{3}{4}$ to $2\frac{1}{2}$ ft. high, leafy; leaflets 9 to 17, thin, ovate, incised-serrate, mostly about $\frac{1}{2}$ in. long; calyx-tube becoming purplish in age.—Carmel River, *Jepson*, Aug. 1896; a form as to habit intermediate between *P. Californica* on the one hand, and *P. elata* and *P. tenuiloba* on the other.

The following is a closely allied species not seen by us:—*P. FRONDOSA* Greene. Erect or decumbent, $1\frac{1}{2}$ to 3 ft. high, leafy throughout, viscidly hirsute and heavy scented; leaflets 5 to 9, doubly incised; stipules ovate-lanceolate, coarsely incised; cyme widely spreading, loose and leafy; calyx short-campanulate, the spreading bractlets exceeding the calyx-lobes, 3-toothed at apex; petals ligulate; stamens very unequal.—Near Martinez and Santa Cruz.

6. *P. elata* Greene. One and one-half to 2 ft. high; herbage glandular, pilose-pubescent; radical leaves 6 to 12 in. long, the leaflets 15 to 19, thin, cuneate-obovate, $\frac{1}{2}$ in. long or less, once or twice incisely cleft; flowers solitary or in 3's; bractlets of the calyx equaling the segments, lanceolate; petals spatulate, white; stamens 10, 5 short and with filiform filaments, the other 5 with filaments deltoid-dilated at base.

Middle North Coast Ranges from Howell Mountain and Calistoga northward to Elk Mountain, Lake Co. July.

7. *P. Kelloggii* Greene. Stems stout, ascending or reclining, 1 to 2 ft. long; herbage glandless, white-silky with short dense hairs; radical leaves 4 to 10 in. long, the leaflets obovate, coarsely toothed, $\frac{1}{2}$ to 1 in. long; calyx-tube cup-shaped, its lobes lanceolate, equaled by the oblong entire bractlets; petals white, spatulate-oblong, 3 lines long.—(*Horkelia Californica* C. & S. var. *sericea* Gray.)

Alameda to Pacific Grove. June. Fragrant acc. to Kellogg, scentless acc. to Greene.

8. *P. tenuiloba* (Gray) Greene. Stems about 1 ft. high; radical leaves 4 to 6 in. long, mostly villous with grayish hairs; leaflets 8 to 15 pairs, 2 or 3 lines long, cuneate-obovate, deeply 4 to 8-cleft into linear lobes, the segments rather less than $\frac{1}{2}$ line wide; upper leaves with fewer leaflets, these narrow and few-lobed or linear and entire; flowers in close cymes; calyx 2 lines long, with linear lobes; petals narrowly cuneate, notched at apex, exceeding the calyx.—(*Horkelia fusca* var. *tenuiloba* Torr.)

Laguna of Santa Rosa Creek, *Bigelow*, 1854. Very rarely collected.

Var. *Micheneri* (P. Micheneri Greene). Leaves 3 in. long, glabrous when young, glabrate in age; leaflets crowded, the lobes narrowly oblong, obtuse; cymes very much condensed; petals cuneate-obcordate; filaments broadly dilated, of nearly uniform breadth from base to apex.—Mt. Tamalpais, *Michener*, June 1, 1892.

9. *P. Bolanderi* (Gray) Greene. Leaves tufted from the branching crown of a perennial root, hoary-pubescent, 1 to 2 in. long; leaflets cuneate-obovate, 2 or 3 lines long, toothed or cleft at apex, the teeth acute; flowering branches very sparingly leafy, 2 to 10 in. high, the flowers in a rather open cyme; calyx 2 lines long, about equaling the white oblong-spatulate petals; calyx-lobes and bractlets lanceolate; achenes minutely granular.—(*Horkelia Bolanderi* Gray.)

Dry hills about the southern shores of Clear Lake; to be expected in northeastern Napa Co. July.

9. AGRIMONIA L. AGRIMONY.

Perennial herbs with pinnate leaves and serrate leaflets. Flowers yellow, in racemes. Bracts 3-cleft. Calyx-tube turbinate, contracted at the throat and the upper part beset with a ring of hooked prickles, indurated in fruit and enclosing the 2 achenes; calyx-limb 5-cleft, the lobes closing over the throat after flowering. Stamens 5 to 15. Styles terminal. (Name a corruption of the Greek word *argema*, a disease of the eye, the plants reputed to be medicinal.)

1. **A. gyrosepala** Wallr. COMMON AGRIMONY. Stems erect, 2 to 3 ft. high; herbage glandular, and both hirsute and puberulent; leaflets 5 or 7, with interposed smaller ones, ovate or obovate, $3\frac{1}{2}$ in. long or less, coarsely toothed, entire at the base; terminal leaflet usually largest and cuneate at base; flowers $2\frac{1}{2}$ lines long.—(A. Eupatoria of Bot. Cal., etc.)

Borders of woods in the mountains: Elk Mountain, Lake Co.; northern Sierra Nevada.

10. ACÆNA L.

Perennial herbs with a woody base, pinnate leaves and pinnatifid leaflets. Flowers in more or less crowded spikes. Calyx persistent, its tube oblong, contracted at the throat, at length armed with retrorsely barbed prickles; limb 3 to 7-parted, valvate, deciduous. Petals none. Stamens commonly 3 to 5, but varying from 1 to 10. Pistils 1 or 2, free and distinct; style terminal; ovule solitary, suspended. Achene enclosed in the indurated calyx. (Greek *akaina*, a thorn, in reference to the spines on the calyx.)

1. **A. trifida** R. & P. Flowering stems erect with decumbent base, 5 to 13 in. high, sometimes almost naked, the leaves borne mostly at base or tufted on the short woody branches crowning the perennial root; herbage villous, especially when young, and more or less silky on the under surface of the leaves; leaflets 11 to 17, nearly uniform, 3 to 4 lines long, pinnately cleft into 3 to 7 segments; flowers green, in a crowded spike, or the lower flowers remote; calyx-tube white-hirsute with short hairs and armed with slender prickles, in fruit 4-angled; stamens dark purple; achene round-oblong.

Dry or rocky soil of hilltops in the Coast Ranges near the ocean from Marin Co. and the Oakland Hills to the Gabilan Range and Monterey. June.

11. ALCHEMILLA L. LADY'S MANTLE.

Ours a diminutive annual herb with palmately lobed leaves and sheathing stipules. Flowers minute, greenish, pediceled and fascicled in the axils. Calyx persistent, its tube pitcher-shaped, *i. e.*, enlarged above the base and somewhat contracted at the throat; limb 4 or 5-parted and bearing an equal number of alternate bractlets, or these minute or obsolete. Petals none. Stamens 1 to 4. Pistils 1 to 4 (in ours 1), distinct, the slender style lateral or arising from near the base. Achene ovate, slightly compressed, smooth, concealed in the tube of the persistent calyx. (So named because valued in alchemy.)

1. **A. arvensis** (L.) Scop. Simple or commonly branching from the base, 1 to 3 in. high or more, the branches slender and flower-bearing throughout; herbage scantily pubescent with soft hairs; leaves fan-shaped, 3-parted, the segments 2 or 3-cleft; calyx about $\frac{1}{2}$ line long, the tube usually densely hirsute and much contracted under the lobes.

Hills and plains; common. Apr. A sheet of specimens (identical

in habit and aspect) collected by Bioletti at Byron, Apr. 8, 1892, exhibit on different individuals calyces densely hirsute and calyces perfectly glabrous.

12. OSMARONIA Greene.

Shrub with simple entire deciduous leaves and caducous stipules. Flowers dioecious, white, fragrant, in nodding racemes terminating leafy branchlets. Calyx turbinate-campanulate, 5-lobed, deciduous. Petals erect in the pistillate flower, spreading in the staminate. Stamens of staminate flower 15, in 3 rows, 10 inserted with the petals, 5 inserted lower down upon the disk lining the calyx-tube; stamens of pistillate flower present but abortive. Pistils 5, simple, free and distinct, glabrous; styles short, lateral, jointed at base; ovules 2 to each ovary, pendulous. Fruit consisting of 1 to 4 ovoid drupes with a thin pulp and bony stone. Seed solitary; cotyledons convolute. (Osme, Greek adjective meaning fragrant, and Aronia, a genus founded by Persoon and now referred to *Amelanchier*.)

1. *O. cerasiformis* (T. & G.) Greene. OSO BERRY. Three to 9 ft. high, the branchlets reddish; leaves glabrous, broadly oblong, narrowed to each end, mucronate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long when mature, short-petioled; racemes with conspicuous bracts, several from leafy winter buds, rarely solitary; petals of staminate flower ovate, 3 lines long; petals of pistillate flower spatulate or obovate, 2 lines long; drupes blue-black, 5 to 7 lines long, the pulp bitter.—(*Nuttallia cerasiformis* T. & G.)

Frequent in the outer (or seaward) Coast Ranges (Marin Co., San Francisco, Oakland Hills); rare in the inner Coast Ranges (Mt. Diablo; Tolenas Springs, Solano Co., *Platt*). Mar.—Apr., fruiting in July. Scales of the winter buds homologous with blades.

13. CERASUS L. CHERRY.

Trees or shrubs. Leaves simple, serrate, conduplicate in the bud. Flowers white, in corymbs or in racemes from lateral buds. Calyx 5-cleft, deciduous after flowering. Stamens 15 to 30. Pistil 1; style terminal. Drupe globose, without bloom; flesh in our species sweet or bitter; stone globose, not prominently margined. (Greek *kerasos*, the cherry tree, the name from *Cerasus* in Pontus.)

Leaves deciduous, serrate or serrulate.

Flowers in corymbs; leaves commonly with 1 or 2 glands near base of blade 1. *C. emarginata*.

Flowers in racemes, the peduncle leafy; petiole with 1 or 2 glands below the blade 2. *C. demissa*.

Leaves evergreen, coriaceous, spinose-toothed; flowers in racemes, the peduncle leafless 3. *C. ilicifolia*.

1. *C. emarginata* Dougl. RED CHERRY. Shrub 3 to 8 ft. high, with smooth dull red bark; leaves ovate or more commonly oblong-obovate, mostly obtuse, finely serrulate, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, on petioles 1 to 3 lines long; blade with 1 or 2 glands just above junction with petiole; flowers in short corymbs; fruit 4 or 5 lines long, bright red, the pulp intensely bitter.

Frequent in the Sierra Nevada; rare in the region of San Francisco Bay (Oakland Hills; Mt. Tamalpais).

2. *C. demissa* Nutt. WESTERN CHOKE-CHERRY. Erect slender deciduous shrub, 2 to 10 ft. high; leaves oblong-ovate or more commonly oblong-obovate, acute at apex or abruptly short-pointed, finely serrate, 1 to 3 in. long; petioles $\frac{1}{2}$ in. long, with 1 or 2 glands just below its summit; racemes 2 to 4 in. long, terminating more or less leafy peduncles; drupe red or dark purple, $3\frac{1}{2}$ lines long, astringent.

Common: Sierra Nevada Mountains; middle North Coast Ranges (Napa Mountains); Oakland Hills; Mt. Hamilton, *Greene*. Rare on the seaboard or altogether absent. Last of Apr.—June.

3. *C. ilicifolia* Nutt. ISLAY. Evergreen, 8 to 18 ft. high; leaves coriaceous, elliptic or ovate, acute or obtuse, spinose-toothed, 1 to 2 in. long, short-petioled; racemes 1 to $2\frac{1}{2}$ in. long, on axillary leafless peduncles; flowers 2 lines long; drupe red or dark purple, 6 to 8 lines thick, slightly obcompressed, apiculate; flesh thin, sweetish when ripe.

Oakland Hills; San Francisco Peninsula; Loma Prieta and southward to Santa Barbara. May—June.

14. PRUNUS L. PLUM.

Shrubs or small trees. Leaves simple, serrate, convolute in the bud; stipules free, small or minute. Flowers in umbels borne on the wood of the previous season, appearing before or with the leaves. Calyx, corolla, stamens and pistil as in *Cerasus*. Fruit an ovoid drupe with fleshy sarcocarp of an acid taste and bony stone. Stone smooth, compressed, acutely edged on one margin and grooved on the other. (Classical name of the Plum.)

1. *P. subcordata* Benth. SIERRA PLUM. Shrub 5 to 7 ft. high or sometimes arborescent and 10 ft. high, with crooked and rough gray-brown branches, and more or less spinescent branchlets; leaves ovate, elliptic to almost round, obtuse or truncate at base, rarely subcordate, 2 in. long or less, on petioles 2 or 3 lines long; flowers appearing with the leaves, 2 to 4 in a cluster, on pedicels $\frac{1}{2}$ in. long; sepals linear or slightly acute, $1\frac{1}{2}$ lines long; petals obovate, somewhat concave, 4 lines long; stamens 25 or 30; drupe red, $\frac{3}{4}$ to nearly 1 in. long, the pulp rather hard but more or less edible.

Sierra Foothills, more abundant northward. Coast Ranges: Vaca Mountains; Napa Mountains; Oakland Hills. Apr.

15. HETEROMELES Rœm.

Evergreen shrub with simple coriaceous serrate leaves. Flowers white, small, numerous, in terminal corymbose panicles. Calyx turbinate, 5-cleft. Petals 5, spreading. Stamens 10, in pairs opposite the calyx-teeth; filaments dilated at base and somewhat connate. Pistils 2, lightly united, tomentose above, and only half-adherent to the fleshy calyx-tube, the thickened persistent calyx-teeth closed

over them. Fruit bright red, berry-like, ovoid. Seeds 1 or 2 in each cell. (Greek heteros, different, and melon, an apple.)

1. *H. arbutifolia* Rœm. CHRISTMAS BERRY. TOYON. Shrub, rarely a small tree, 5 to 15 or 20 ft. high; leaves oblong, acute at base and apex, dark green, lighter beneath, sharply serrate, 2 to 4 in. long, on petioles $\frac{1}{2}$ to $\frac{3}{4}$ in. long; panicle in anthesis rather dense, 2 or 3 in. high; corolla $2\frac{1}{2}$ lines in diameter; fruit 3 or 4 lines long, the seeds obovate, flat on one side, convex on the other, $\frac{1}{2}$ as long.

Common on mountain sides and along streams everywhere in the Coast Ranges, flowering in July. It is one of the showiest of Californian shrubs when covered from Nov. to Jan. with its fine clusters of crimson berries.

16. CRATÆGUS L. THORN.

Thorny shrubs with simple toothed or lobed leaves. Flowers mostly white, heavy-scented, corymbose. Calyx-tube urn-shaped. Petals rounded. Stamens 5 to 20. Ovary inferior, or its summit free, 2 to 5-celled, or the carpels merely contiguous and not united; styles distinct. Pome more or less drupe-like, red or purple, containing 2 to 5 bony 1-seeded nutlets, these united or separable; calyx-teeth persistent. (Greek kratos, strength, in reference to the wood.)

1. *C. rivularis* Nutt. Shrub 9 to 14 ft. high; thorns stout, $2\frac{1}{2}$ in. long; leaves elliptic to obovate, doubly serrate, entire towards the base and often cuneate, shortly petioled, $1\frac{1}{4}$ to $2\frac{3}{4}$ in. long; fruit reddish-brown (or nearly black?), 3 or 4 lines long.

Common in Oregon and northwestern California but rare within our limits: forming thickets in Sonoma Co., *Davy, Baker*.

17. MALUS Juss. APPLE.

Trees or shrubs with simple deciduous leaves and stipules which disappear early. Flowers white or pink, in corymbs. Calyx-tube urn-shaped. Petals rounded, with claws. Styles usually 5, united at base; ovules 2 in each cell of the inferior ovary, the carpels more or less coriaceous. Fruit a pome, commonly depressed-globose and sunken at each end. (Latin name of the apple.)

1. *M. rivularis* (Dougl.) Rœm. OREGON CRAB APPLE. Shrub or small tree, 12 to 20 ft. high; leaves ovate to lanceolate, less than 1 to 4 in. long, on petioles $\frac{1}{3}$ or $\frac{1}{4}$ as long; pedicels mostly less than 1 in. long; petals white, broadly elliptic, 3 or 4 lines long; fruit variable in color, yellow or partly or wholly red, obovate-oblong, not sunken at base, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; calyx-lobes at length deciduous (acc. to Watson).—(*Pyrus rivularis* Dougl.)

North Coast Ranges: Sonoma Co.; "Soda Springs, Napa Valley, tree 25 to 30 ft. high, 8 in. [in diameter] at base, 6 in. at 6 ft. where it branches with the beauty of an elm." *Kellogg*; Mendocino Co. and northward to Oregon. May.

18. AMELANCHIER Medic. JUNE BERRY.

Shrubs or small trees with simple serrate leaves. Flowers white in

racemes. Calyx-tube campanulate, more or less adnate to the ovary, the limb 5-parted, the lobes narrow, reflexed, and persistent. Petals 5, ascending. Stamens indefinite, about 20, the outer row with longer filaments. Pistil 1; styles 5, united below; ovary partly or wholly inferior, 5-celled, each cell in fruit divided into 2 by a partition from the back. Fruit berry-like, globose, the cells 1-seeded. (Savoy name of the Medlar.)

1. *A. alnifolia* Nutt. Shrub 8 to 15 ft. high; leaves mostly elliptic, sharply serrate near the apex or less commonly entire, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; petioles 4 to 6 lines long; racemes short and rather dense; petals broadly oblong, or somewhat cuneate at base, 5 lines long; fruit purplish, $2\frac{1}{2}$ or 3 lines in diameter.

Hillsides of the Coast Ranges: Napa Valley; Oakland Hills, etc. Sierra Nevada. Very showy and beautiful in Apr.

64. LEGUMINOSÆ. PEA FAMILY.

Herbs, shrubs, or trees with alternate stipulate leaves, in ours compound (except in *Cercis*). Leaflets 1 to many, usually entire. Calyx synsepalous, 5-toothed or -cleft, or in *Lupinus* bilabiate, mostly persistent. Corolla with 5 petals, in nearly all of ours papilionaceous, *i. e.*, highly irregular and butterfly-like: the upper petal is called the banner; the lateral petals are called the wings; the two lower petals are joined by their edges to form the keel; the banner in the bud enfolds the wings which in turn cover the keel-petals; the claws of all the petals are free from one another. Stamens 10; united into a sheath around the ovary (monadelphous), or the upper stamen distinct from the others (diadelphous) or sometimes all distinct. Pistil 1, 1-celled. Fruit a legume (2-valved pod), with 1 row of seeds on the ventral side, commonly opening by both the dorsal and ventral sutures, the valves twisting in opposite directions, or sometimes indehiscent. Seeds mostly kidney-shaped, without endosperm. The corolla of *Cercis* is nearly regular. *Amorpha* has but one petal. The exceptions to the ordinal diagnosis are many but only those which concern our flora are here noted. This is one of the largest of the natural orders, many species yielding important products.

Leaves simple; corolla obscurely papilionaceous, only slightly irregular; shrubs 1. *CERCIS*.

Leaves compound; corolla papilionaceous, except no. 6.

Stamens distinct; leaves palmately 3-foliolate.

Flowers yellow, in racemes; stipules conspicuous; herbs 2. *THERMOPSIS*.

Flowers purple, solitary; stipules none; very spiny shrub 3. *XYLOThERMIA*.

Stamens diadelphous or monadelphous.

Calyx 5-toothed.

Leaves unequally pinnate, leaflets many; flowers in racemes or spikes.

Herbage not glandular; stamens diadelphous; pod commonly inflated or turgid. 4. *ASTRAGALUS*.

Herbage glutinous or glandular-dotted.

Pod prickly; herb. 5. *GLYCYRRHIZA*.

Pod small, smooth, 1 or 2-seeded; shrub 6. *AMORPHA*.

Leaves pinnately 3-foliolate, glandular and aromatic; flowers in axillary spikes; pod indehiscent, 1-seeded; herbs. 7. *PSORALEA*.

Leaves equally pinnate, the rachis produced into a branched tendril, rarely terminating in a bristle or imperfect leaflet.

Style hairy all around at summit 8. VICIA.

Style hairy on the upper side 9. LATHYRUS.

Leaves equally or unequally pinnate, the leaflets commonly 3 to many, sometimes 1 or 2; flowers in umbels, sometimes solitary 10. LOTUS.

Leaves 3-foliolate.

Flowers in a head or head-like inflorescence, rarely in a capitate umbel or short spike; corolla withering-persistent after flowering; leaves palmately 3, sometimes 4 or 5-foliolate 11. TRIFOLIUM.

Flowers in a raceme or spike; corolla deciduous after flowering; leaves pinnately 3-foliolate.

Pod small, globose; style filiform 12. MELILOTUS.

Pod curved or spirally coiled; style subulate. . . 13. MEDICAGO.

Calyx deeply bilabiate; stamens 5 long and 5 short, their filaments monadelphous but free at apex; flowers racemose, mostly in whorls; leaves palmate, of 4 to many leaflets 14. LUPINUS.

1. CERCIS L. JUDAS TREE.

Shrubs. Flowers red-purple, in umbel-like fascicles, appearing from winter buds in advance of the simple leaves. Stipules caducous. Calyx in anthesis broader than long, with 5 broad obtuse teeth. Corolla obscurely papilionaceous; banner smaller than the wings and enclosed by them in the bud; keel-petals larger than the wing-petals and not united. Stamens 10, distinct, declined, the filaments clavate-dilated towards the base. Pod oblong, very flat, the upper suture with a winged margin. Embryo straight.

1. *C. occidentalis* Torr. WESTERN RED-BUD. Eight to 10 ft. high, the branches rather widely spreading; leaves round, cordate at base with nearly closed sinus, $2\frac{1}{2}$ to $3\frac{1}{2}$ in. broad; pods about 2 in. long and 8 lines wide.

Foothills of the Sierra Nevada and inner Coast Ranges. Mar.-Apr.

2. THERMOPSIS R. Br. FALSE LUPINE.

Perennial herbs with commonly erect clustered stems. Leaves palmately 3-foliolate, petioled, and with free leaf-like stipules. Flowers yellow, in a terminal raceme, the pedicels subtended by persistent bracts. Calyx campanulate, deeply toothed, the two upper teeth in ours almost completely united. Banner roundish, shorter than the oblong wings, the sides reflexed; keel nearly straight, obtuse, its petals very lightly joined, equaling the wings. Stamens distinct. Pod long, linear, flat, several-seeded. (Greek *thermos*, lupine, and *opsis*, resemblance.)

1. *T. macrophylla* H. & A. Stems somewhat branched above, 1 to 2 ft. high; leaves silky or whitish-pubescent when young, soon glabrate, at least above; leaflets broadly or narrowly obovate and often more or less rhomboidal, acute at each end, or some obtuse above (even on the same plant), $1\frac{1}{2}$ to 3 or 4 in. long; stipules strongly oblique or not at all oblique, even on the same plant, longer than the petioles; upper lip of calyx slightly notched; lower calyx-teeth shorter than or as long as tube; raceme rather dense, 3 to 6 in. long; pod straight, silky, 2 to 5-seeded.—(*T. Californica* Wats.)

Monterey, *Brewer*, no. 704; Glenwood, Santa Cruz Mountains; San Mateo Co.; Marin Co.; Sonoma Co.; Napa Valley, and northward to Mendocino Co. Not known from the inner North Coast Ranges nor from Contra Costa or Alameda Cos. Leaves and leaflets so variable in size, outline, and pubescence that Watson's *T. Californica* (founded primarily on specimens from Corte Madera) is here readily included. The var. *velutina* Greene from Mt. Hamilton has small leaflets with a dense velvety pubescence.

3. *XYLOTHERMIA* Greene.

Very rigid and spiny evergreen shrub. Leaves palmately 1 to 3-foliolate, nearly sessile and without stipules. Flowers large, purple, axillary, solitary and short-pedicelled. Calyx campanulate (turbinate or clavate at base), the border with 4 very low broad teeth. Petals equal, the banner orbicular with reflexed sides, the wing- and keel-petals oblong, the latter distinct and straight. Stamens distinct. Pod linear, flat, stipitate, straight, several-seeded. (Greek *xulon*, wood, and *thermos*, lupine.)

1. *X. montana* (Nutt.) Greene. *PICKERINGIA*. Densely branched shrub, 3 to 5 ft. high, the branchlets very spinose; leaflets oblong-oblancoelate, acute at each end, entire, 2 to 6 lines long; flowers near the ends of the branchlets, rose-purple, $\frac{3}{4}$ in. long, on very short pedicels, bearing 2 minute subulate bractlets near the middle; stamens persistent; pod exserted on the stipe, about 2 in. long, 6 to 10-seeded, somewhat constricted between the seeds.

Higher altitudes of the Coast Ranges: frequent on dry slopes from Mt. St. Helena, the Vaca Mountains and Mt. Tamalpais southward to Southern California. May-June.

4. *ASTRAGALUS* L. RATTLE-WEED. LOCO-WEED.

Herbs with odd-pinnate leaves. Flowers purple, pale yellow or white, in spikes, racemes or heads. Racemes mostly spike-like, either the pedicels very short or the flowers crowded. Calyx 5-toothed. Corolla usually long and narrow; keel obtuse. Stamens diadelphous; anthers all alike. Pod 2 to many-seeded, commonly turgid or inflated and bladder-like, 1-celled or partly 2-celled by the intrusion of one or both sutures, tardily dehiscent. Seeds small, usually reniform on slender funiculi. (Ancient Greek name for some leguminous plant.)

Annuals.

Pods didymous, wrinkled, 2-seeded.

Spikes capitate or oblong; pods erect, little exserted from the calyx . . . 1. *A. didymocarpus*.

Spikes cylindrical; pods deflexed, well exserted from the calyx 2. *A. nigrescens*.

Pods not didymous, nor wrinkled, several-seeded; inflorescence capitate.

Pods narrowly oblong, not beaked 3. *A. tener*.

Pods with a stout body and long incurved beak. . . 4. *A. Breweri*.

Perennials; pods 1-celled except no. 11.

Pods inflated or bladder-like and

stipitate.

Stipe long and filiform; leaflets 21 to 31. 5. *A. leucophyllus*.

Stipe recurved, little exceeding the calyx; leaflets 9 to 21.

6. *A. oxyphysus*.

Sessile in the calyx.

Peduncles mostly longer than the leaves; flowers spreading or deflexed.

Flowers white; stipules distinct. 7. *A. Crotalariae*.

Flowers yellowish white or greenish; stipules mostly united opposite the petiole; raceme often long. 8. *A. Menziesii*.

Peduncles shorter than the leaves; flowers mostly erect, yellow or creamish; stipules distinct; raceme short. 9. *A. Douglasii*.

Pods not inflated.

Herbage hoary; raceme dense, $1\frac{1}{4}$ to 2 in. long; pods crowded, retrorsely imbricated, 4 lines long. 10. *A. pycnostachys*.

Herbage nearly glabrous; racemes loose, 3 to 6 in. long; pods deflexed, $2\frac{1}{2}$ lines long. 11. *A. Clevelandi*.

1. *A. didymocarpus* H. & A. Slender, 3 to 10 in. high, pubescent; leaflets 9 to 15, narrowly oblong to linear and more or less cuneate, sharply notched at apex, 3 to 5 lines long; spikes dense, capitate or oblong, 4 to 6 lines long, on long peduncles; flowers $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, dull purplish; calyx rather densely hirsute with black hairs; pods with a minute short scattered pubescence, erect, 2 lines long and about as broad, scarcely exerted from the calyx, strongly nerved transversely, so deeply 2-lobed lengthwise as to be divided into 2 cells, the fruit therefore twin-like with 1 large seed in each cell.

Low hills: Antioch and Kirker Pass southeastward to the head of the San Joaquin Valley and westward to San Luis Obispo Co. Apr.

2. *A. nigrescens* Nutt. Smaller and more slender than the last and less pubescent; flowers dull and commonly minute but sometimes large; fruiting spikes cylindrical, much less dense, 3 to 10 lines long; pods deflexed, well exerted from the calyx, hirsute-pubescent, wrinkled and strongly obcompressed.

Vaca Mountains; Mt. St. Helena; Mt. Diablo; Berkeley; Marin Co. and southward to Southern California. Also in the Sierra Foot-hills. Apr.

3. *A. tener* Gray. Slender, 4 to 9 in. high, minutely pubescent; leaflets 9 to 15, linear or cuneate, either acute or emarginate at apex; inflorescence capitate, the head 5 to 9-flowered; flowers purple and white; 5 lines long; calyx with minute and short appressed brown hairs; pod silvery when young, glabrous when mature, coriaceous, narrowly oblong, 8 lines long, somewhat incurved, 2-celled, 5 to 10-seeded; fruiting peduncle 2 in. long, at length spreading, declined or even reflexed.

Alkaline fields, mostly in moist places: Solano Co. to Alameda Co. May.

4. *A. Breweri* Gray. Much like the preceding but smaller, relatively stouter and the leaflets broader; heads 5 to 7-flowered: pods 1-celled or nearly so, the body short with a long incurved beak.

First collected in Sonoma Valley by Brewer, California Geological Survey, no. 979, Apr. 18, 1862.

5. *A. leucophyllus* T. & G. Stem erect, stoutish, 2 or 3 ft. high; the growing parts silvery-canescant, glabrate and greenish in age;

leaflets 21 to 31, narrowly oblong or linear, 6 to 10 lines long; raceme densely flowered and long-peduncled; flowers 6 to 8 lines long; calyx-teeth subulate, about $\frac{1}{2}$ the length of the oblong tube; corolla yellowish white; pod obliquely oval, thin, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long, on a filiform pubescent stipe of almost equal length.

Low dry hills: western side of the Lower Sacramento Valley; Mt. Diablo Range from Livermore Pass westward to Niles Cañon.

6. **A. oxyphysus** Gray. Habit of the preceding; growing parts canescent, becoming green but not glabrous; leaflets 9 to 21, oblong, $1\frac{1}{4}$ in. long or less, the lower as much as 5 lines wide; penduncle much exceeding the leaves, bearing an elongated densely flowered raceme; corolla greenish white, 8 lines long; pod $1\frac{1}{2}$ in. long, clavate-obovate, oblique, acuminate at apex, strongly contracted at base into the recurved stipe which exceeds the calyx.

Dry hills of the Mt. Diablo Range; first collected near Arroyo del Puerto, western Stanislaus Co., by Brewer, no. 1259.

7. **A. Crotalariae** (Benth.) Gray. Glabrous, except the pubescent growing parts; stems stout, decumbent; leaflets 21 to 35, linear-oblong to broadly obovate, retuse or obtuse, thickish, 5 to 12 lines long; stipules triangular-subulate, distinct; racemes 4 to 10 in. long; calyx-teeth broadly subulate, one-half as long as the short-campanulate tube; corolla white, 6 lines long; pod almost papery, much inflated, ovoid, 1 to $1\frac{1}{2}$ in. in length.

San Francisco to Southern California. May.

8. **A. Menziesii** Gray. Plant stout, erect, 2 to 4 ft. high; young herbage whitish pubescent, soon green, but hirsute-pubescent; leaflets 21 to 43, commonly crowded on the rachis, broadly oblong, less frequently cuneate-obovate or narrowly ovate, usually retuse at apex, 5 to 8 lines long; stipules broad, not pointed, all but the uppermost continued around the stem and nearly meeting or even united on the side opposite the leaf; corolla 4 to 6 lines long, yellowish white or greenish, the keel purple-tipped; raceme short and dense ($1\frac{1}{2}$ in. long), or longer and loose; peduncles 3 to 6 in. long; pod thin-walled, 1 to 2 in. long, otherwise similar to the preceding.

Sandy soils near the coast: San Francisco and Alameda to Monterey and southward. June-Aug.

9. **A. Douglasii** (T. & G.) Gray. Herbage cinereous when young, almost glabrous in age; stems ascending, 1 ft. high; leaflets numerous, linear to oblong, 4 to 9 lines long; stipules mostly subulate; peduncle shorter than the leaves, bearing a dense 10 to 20-flowered raceme; calyx-teeth subulate, shorter than the campanulate tube; corolla scarcely twice the length of the calyx, 4 lines long, yellow or creamish; pod thin-walled, obliquely ovoid, $1\frac{1}{2}$ to 2 in. long.

Gravelly stream-beds: San Benito River and southward in the Coast Ranges.

10. **A. pycnostachys** Gray. Herbage more or less villous-hoary; stems stoutish, 1 or 2 ft. high; leaflets numerous (about 18 or 19 pairs), linear to oblong; flowers numerous in a dense oblong or cylindrical

spike-like raceme, $1\frac{1}{2}$ to 2 in. long; peduncle longer than raceme; corolla 5 to 6 lines long; pods crowded, retrorsely imbricated, ovate, narrowed at apex into the persistent and prominent style, somewhat flattened laterally and margined by the prominent sutures, 1-celled, the wall thin and reticulated; body of pod 3 to 4 lines long; seeds 1 to 3.

Salt marshes or about springy places in open cañons in Marin Co. near the sea: Bolinas Bay, *Bolander*, 1868; *Miss M. E. Parsons*, 1896; Drake's Bay, *Jepson*, 1900; Point Reyes. June.

11. **A. Clevelandi** Greene. Herbage yellowish green and nearly glabrous; stems slender, erect, 2 to 3 ft. high; leaflets 15 to 21, 3 to 7 lines long, narrowly oblong, broadest below the middle; peduncles very long, much exceeding the leaves, bearing a loose spike-like raceme 4 to 6 in. long; corolla white; pod coriaceous, oblong, acute, finely nerved on the sides, $2\frac{1}{2}$ lines long, deflexed, 2-celled.

Local in the hilly region between the Mayacamas and inner Coast Ranges: Indian Valley, Lake Co., *Daniel Cleveland*, 1882; Butt's Cañon, northern Napa Co., *Jepson*, 1897. June-July.

5. GLYCYRRHIZA L. LIQUORICE.

Perennial herbs with glandular-viscid herbage, odd-pinnate leaves and minute stipules. Flowers yellowish white, in axillary peduncled spikes. Calyx 5-cleft, with the 2 upper lobes shorter or partly united. Stamens monadelphous or diadelphous, the alternate anthers smaller. Ovary 2 to many-ovuled; style short and rigid, curved at the tip. Pod short, flattened, prickly, few-seeded, indehiscent. (Greek glukus, sweet, and rhiza, root.)

1. **G. lepidota** Nutt. var. **glutinosa** Wats. More or less viscid-puberulent, or the peduncles with spreading glandular hairs; stems erect, 2 ft. high, sometimes scurfy or with minute scales; leaflets 11 to 15, oblong- to ovate-lanceolate, 1 to $1\frac{1}{2}$ in. long; stipules persistent; spikes broadly oblong, exceeding 1 in., the peduncles shorter, or more commonly longer and as much as $2\frac{1}{2}$ in. long; flowers yellowish white; calyx very glandular; pod oblong, $\frac{1}{2}$ in. long, reddish-brown, bur-like, beset with hooked prickles, 2 to 6-seeded.

Rich soil of low or moist lands in the valleys or on the plains: Solano and Sonoma Cos. to Alameda Co. and southward to Southern California. June.

6. AMORPHA L.

Deciduous shrubs with pellucid-glandular heavy-scented herbage. Leaves odd-pinnate, with caducous stipules and stipels. Flowers small, violet or purple, in long and narrow terminal spikes, which are either solitary or clustered. Calyx obconic, 5-toothed, persistent. Petals wanting except the banner, this erect, concave, unguiculate. Stamens 10, monadelphous at the very base, otherwise distinct. Pod short, but exceeding the calyx, 1 or 2-seeded, tardily dehiscent. (Greek amorpos, deformed, alluding to the corolla.)

1. **A. hispidula** Greene. Four to 7 ft. high; leaflets 11 to 27,

oblong-elliptical, mucronulate at the retuse apex, shortly petioled, 7 to 12 lines long; rachis pubescent and with prickle-like glands scattered among the sessile ones, often becoming glabrous late in the season; stipules and bracts lanceolate, deciduous; racemes 2 to 4 in. long; calyx $1\frac{1}{4}$ lines long, its teeth silky, lanceolate, twice the length of the tube; corolla twice as long as the calyx; pod $2\frac{1}{2}$ lines long, with many low circular glands which are depressed or somewhat excavated in the center.

Wooded cañons: Pope Valley, *Bolander*, and Calistoga to Mt. Tamalpais and southward near the coast. May.

7. PSORALEA L.

Ours perennial herbs. Herbage heavy-scented, punctate with dark dots. Leaves 3-foliolate; stipules free from the petiole. Flowers purple or whitish in spikes or racemes. Calyx 5-cleft, its lobes nearly equal. Keel broad, obtuse, joined to the wings. Stamens monadelphous or diadelphous; anthers uniform. Pod seldom exceeding the calyx, 1-seeded, indehiscent. (Greek *psoraleos*, scurfy or rough, the glands wart-like in some species.)

Two shrubby cultivated species of *Psoralea* are said to have been found wild in the Bay Region: *P. GLANDULOSA* L. has pinnately 3-foliolate leaves with ovate-lanceolate leaflets 2 in. long, the petioles 1 to $1\frac{1}{2}$ in. long; flowers bluish, more or less verticillate, in racemes. *P. BRACTEATA* L. (*P. fruticosa* Kellogg) has palmately trifoliolate leaves; leaflets $\frac{1}{2}$ to $\frac{3}{4}$ in. long, oblong-obovate, mucronate; petioles 1 to 2 lines long; spikes short, dense, terminal, not peduncled.—“Streams of Mt. Tamalpais, F. P. McLean, 1873.”

Leaves pinnately 3-foliolate.

Stem prostrate; leaves and peduncles erect; flowers racemose; stamens diadelphous. 1. *P. orbicularis*.

Erect plants.

Flowers in spikes, purple.

Peduncles shorter than the leaves; stamens monadelphous. 2. *P. strobilina*.

Peduncles much surpassing the leaves; tenth stamen nearly free.

More or less pubescent; calyx-teeth exceeding the petals. 3. *P. macrostachya*.

Nearly glabrous but for the elevated roundish glands on the stem; calyx-teeth shorter than the petals. 4. *P. Douglasii*.

Flowers in racemes, greenish white; stamens monadelphous. 5. *P. physodes*.

Leaves palmately 5-foliolate. 6. *P. Californica*.

1. *P. orbicularis* Lindl. Herbage finely pubescent, the inflorescence villous; stems prostrate, creeping and rooting, the long-stalked leaves and racemes erect; leaflets $2\frac{1}{2}$ to 3 in. long, the lateral pair obovate, the middle one more nearly orbicular; petioles 6 to 15 in. long; spike varying from 3 or 4 in. to 10 in. long, borne on peduncles which equal or exceed the leaves; flowers 6 lines long; calyx with stipitate glands scattered among the hairs, cleft almost to the base, the lowest tooth as long as the purplish corolla; pod ovate, acute, 3 lines long.

Grassy vales or meadows: near the coast from Southern California

and Monterey to Marin Co. and Point Arena; northward ranging towards the interior (Howell Mountain, Mt. Shasta), but only at considerable altitudes. June. Peduncles sometimes as much as 22 in. high.

2. *P. strobilina* H. & A. Erect, 2 or 3 ft. high, villous throughout and glandular-pubescent on the branches, peduncles and petioles; leaflets orbicular to rhombic-ovate, more glabrous above, 2 in. long; stipules large, membranous, acuminate; peduncles shorter than the leaves; spikes short-oblong, the bracts very large, deciduous; calyx 6 lines long or more, the lower tooth much the longest and equaling the purple corolla; stamens monadelphous; ovary pubescent.

Hill country from Contra Costa Co. and Alameda Co. (Oakland Hills, Torrey, 1865) to Santa Cruz (Bolander, 1865). Seldom collected.

3. *P. macrostachya* DC. Nearly glabrous, villous-pubescent or tomentose; stems erect, 4 or 5 or even 8 or 10 ft. high; leaflets ovate-lanceolate, truncate to acute at base, $1\frac{1}{2}$ to 3 in. long; peduncles very much exceeding the leaves; spikes broadly cylindrical, silky-villous with white hairs; bracts broad, acuminate, as long as the flowers; calyx 3 to 5 lines long, the lower tooth a little the longest, exceeding the purple petals; tenth stamen nearly free; pod hairy, ovate-oblong, acute, flattened, 3 or 4 lines long.

Along rivers and larger streams in the valleys, following the cañon bottoms in the mountains, and abounding in the salt marshes. The most common and widely distributed species of the genus, occurring both in the Coast Ranges and Sierra Foothills. The next is a very closely allied form.

4. *P. Douglasii* Greene. Habit of the preceding, but more slender, nearly glabrous, the stem, and often the petioles, sprinkled with elevated dot-like glands; leaflets rhombic-ovate, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long; racemes narrower than in the last, 2 to 3 in. long, on slender peduncles 3 or 4 in. long; bracts deltoid and long-acuminate, caducous; rachis and calyx densely short-villous, the hairs often blackish, the segments of the latter just shorter than the violet corolla.

Apparently not common. Santa Clara Co. to Marin Co. Aug.-Sept.

5. *P. physodes* Dougl. Low, mostly but 1 ft. high, nearly glabrous; leaflets ovate, varying to orbicular, mostly acute, 1 to 2 in. long; peduncles shorter than the leaves or exceeding them; racemes short, dense, the bracts small; calyx cup-shaped, its teeth very short and subequal, slightly villous with usually dark hairs, rather more than $\frac{1}{2}$ as long as the corolla, at length much enlarged and inflated; corolla 5 to 6 lines long; petals greenish white, the keel purple-tipped; pod roundish, compressed, 3 lines long.

Common in open spots on bushy or wooded slopes of the higher hills or mountains: Monterey; Gabilan Mountains; Mt. Diablo Range; Wild-cat Cañon; Marin Co. and northward. Apr.-June.

6. *P. Californica* Wats. Low and tufted, the stems many from

a woody often branched caudex; pubescence silky and appressed; leaves palmately compound; leaflets 5, orbicular-obovate and cuneate at base, 7 or 8 lines long; stipules scarious, lanceolate; racemes shorter than the leaves, dense, rather less than 1 in. long, on short peduncles; calyx silky-villous, 6 lines long, the linear-acuminate lobes a little exceeding the petals; pod oblong, narrowed to a lanceolate beak, thin-walled, villous; seed dark brown, 2 lines long or more.

A rare plant; summit of Mt. Diablo (the only known locality within our limits); headwaters of the Salinas, *Palmer*. May-July.

8. VICIA L. VETCH. TARE.

Annual or perennial herbs with weak angular stems, often slightly climbing. Leaves pinnate, with several to many leaflets and semi-sagittate stipules, the rachis ending in a simple or branched tendril. Peduncles axillary. Flowers solitary or racemose. Calyx 5-toothed, the 3 lower teeth often longer. Banner oblong, or appearing so by the turning back of the edges; wings united to the middle of the keel. Stamens more or less diadelphous. Style filiform with a tuft of hairs below the stigma all around or sometimes only on the back. Pod flat, 2-valved, 2 to several-seeded. Seeds globose, the funiculus expanded above to cover the hilum, thus arillate. Cotyledons remaining under ground in germination. (Classical Latin name.)

Annuals; flowers few.

Flowers subsessile, 1 or 2 in the axils. 1. *V. sativa*.

Peduncles elongated, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, 1 or 2-flowered. 2. *V. exigua*.

Perennials; peduncles elongated, several-flowered.

Leaflets 8 to 12; peduncles 4 to 8-flowered. 3. *V. Americana*.

Leaflets 20 to 30; peduncles 7 to 18-flowered. 4. *V. gigantea*.

1. *V. sativa* L. COMMON VETCH. TARE. Stems slender, 2 ft. high; leaflets 6 to 12, glabrous, or the margins slightly ciliate, oblong or narrower, truncate or retuse, mucronate, $\frac{2}{3}$ to over 1 in. long; stipules small, toothed; flowers solitary or geminate, nearly sessile, the pedicels 1 line long at most; corolla 8 lines long, little longer than the calyx; banner purple, wings red; calyx-teeth subulate-setaceous, exceeding the tube.

Naturalized from the Old World: Santa Cruz, *Anderson*, 1878; Berkeley; Napa Valley, 1893; Sonoma, *Brewer*, 1862.

2. *V. exigua* Nutt. CALIFORNIA VETCH. Very slender, 1 to 2 ft. high; leaflets 4 to 12, oblong to narrowly linear, acute or obtusish; peduncles filiform, shorter than the leaves, $\frac{1}{2}$ to 2 in. long, 1 or 2-flowered; flowers 2 or 3 lines long, white or purplish; pods glabrous, 4 or 5-seeded.

Stony or sandy soil: Tracy; San Mateo Co.; more common in Southern California. Apr.

Var. *Hassei* (*V. Hassei* Wats.). Stoutier; leaflets deeply notched at apex, the notch mucronate; pod 5 to 8 or sometimes only 3-seeded. —Benicia, *Bigelow*, the upper leaves not notched; Livermore; to Southern California. Not common within our limits.

3. *V. Americana* Muhl. Nearly glabrous; stems 2 to 3 ft. long,

trailing or climbing by branched tendrils, sharply 4-sided or -winged at the angles; leaflets mostly broadly oblong, often widest above the middle, usually obtuse, mucronulate, less than 1 in. long; peduncles shorter than the leaves, 4 to 7 or 8-flowered; flowers at first purplish, changing to bluish, 9 lines long; calyx-tube 2 lines long, the lower teeth longer (1 line long), the upper approximate, incurved.

Common in the hill country. Feb.—May. Very variable in foliage. The following leaf varieties may be distinguished: Var. *linearis* Wats., leaflets 1 to $1\frac{1}{2}$ in. long, $1\frac{1}{2}$ lines wide or less. Var. *truncata* Brewer, leaflets truncate at apex and 3-denticulate.

4. *V. gigantea* Hook. Stout, somewhat pubescent, climbing several ft. high and often forming extensive tangles and draperies over shrubs; leaflets 20 to 30, narrowly oblong or tapering somewhat from the base to the obtuse mucronulate apex; peduncles 7 to 18-flowered; calyx short, lower teeth about equaling the tube; corolla 6 or 7 lines long, pale purple; pods oblong, $1\frac{1}{2}$ in. long, glabrous, 3 or 4-seeded.

San Francisco and Oakland northward near the coast. Mar.—June. Herbage blackening in drying.

9. LATHYRUS L. PEA.

Herbs, ours perennial. In technical character and in habit very similar to *Vicia*. Banner roundish or very broad. Upper teeth of calyx commonly shorter than the lower. Leaflets usually larger, in ours 3 to 5 pairs, mostly mucronate; rachis in some species not prolonged into a tendril. Style flattish, hairy along the upper side only, *i. e.*, next the free stamen. Seeds as in the preceding. (Old Greek name of the Pea.)

Leaves without tendrils; pod shortly stipitate.

Peduncle short, 1 or 2-flowered; stipules small 1. *L. Torreyi*.

Peduncle longer than the leaves, 2 to 6-flowered; stipules larger than the leaflets 2. *L. littoralis*.

Leaves tendril-bearing; racemes many-flowered; pod sessile.

Stems angled.

Herbage dark green, more or less pubescent; diffuse or climbing plants; leaflets 1 in. long; stipules narrowly semi-sagittate, the lobes mostly lanceolate and entire; corolla purplish or purplish-tinged; var. *puberulus* of 3. *L. vestitus*.

Herbage light green, glabrous; leaflets mostly exceeding 1 in., obtuse at base and apex; stipules large, broadly semi-sagittate, ovate, acuminate, the basal lobe broad, rounded and toothed; corolla rose-purple. 4. *L. Bolanderi*.

Stems winged, the wing commonly herbaceous; stipules small, commonly entire.

Herbage puberulent but seemingly glaucous; leaflets elliptic- to narrowly-oblong, $1\frac{1}{2}$ to 2 in. long, acute at both ends, with long straight nerves from or near the base; corolla white or yellowish white, purple-veined. 5. *L. Watsoni*.

Herbage glabrous or nearly so; leaflets linear-lanceolate, about $1\frac{1}{2}$ in. long; corolla rose-purple. 6. *L. Jepsonii*.

1. *L. Torreyi* Gray. Herbage light green, sparingly villous; erect, very slender, 4 to 9 in. high; leaflets thin, elliptic to ovate or oblong, 5 to 7 lines long; leaves with a terminal leaflet or the rachis merely ending in a point; stipules small, semi-sagittate, lanceolate, the lower

lobe very short; flowers purplish, 6 lines long; calyx-teeth subulate, exceeding the tube, or the upper shorter and broader; pod linear-oblong, pubescent, 1 in. long, 3 to 5-seeded.

Shady woods: Santa Clara Co., acc. to Greene, and upper Napa Valley, *Jepson*, northward to Humboldt Co.

2. *L. littoralis* (Nutt.) Endl. Stems many from creeping root-stocks, stout, decumbent; herbage densely silky-villous; leaflets 1 to 3 pairs with a usually smaller or imperfect terminal one, cuneate-oblong, 4 to 6 lines long; stipules ovate or somewhat hastate, 2 or 3 times as large as the leaflets; peduncles exceeding the leaves; flowers 6 to 8 lines long; calyx-teeth nearly equal, as long as the tube; banner purple, the keel and wings white or nearly so; pod oblong, 1 in. long, villous, 3 to 5-seeded.

Maritime: seashore of Marin Co. and northward.

3. *L. vestitus* Nutt. var. *puberulus*. Low and herbaceous, or climbing several feet high on shrubs and woody below; stems angled; leaflets puberulent under a lens, dark green, lighter on the under surface, 1 in. long, 2 to 4 lines wide, tapering to both ends from the middle, usually more acute at apex than at base, mucronulate; raceme many-flowered on a rather short peduncle; flowers 8 or 9 lines long, purplish or purplish-tinged; lowest calyx-teeth lanceolate, nearly equaling or exceeding tube; seed with a small aril.—(*L. puberulus* White.)

The most common species: Napa Valley; Oakland Hills, etc. Mar.–Apr., but often flowering at all seasons.

4. *L. Bolanderi* Wats. Herbage rather light colored, perfectly glabrous; stem angled; leaflets mostly exceeding 1 in., elliptic-ovate, obtuse at base and apex, mucronulate; stipules large, ovate, acuminate or ovate-lanceolate, dilated below into a rounded toothed lobe, often 5 lines broad; lower calyx-teeth distinctly longer than tube; corolla rose-purple, fading yellowish.

Type specimens in Gray Herbarium, Harvard University, collected by Bolander in the Oakland Hills; Berkeley, *Tidestrom*; San Mateo Co.; Angel Island, *Vasey*. Apr. This may prove to be but a sea-board form of *L. Watsoni*.

5. *L. Watsoni* White. Stems stoutish, erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, with zigzag branches; herbage light green, commonly glaucous, finely pubescent; leaves $1\frac{1}{2}$ to 2 in. long, 6 to 8 lines wide, tapering from the middle to each end, acute, mucronate, strongly several-nerved from the base, the nerves branching little and almost parallel; stipules semi-sagittate, narrow, the upper lobe lanceolate, the lower lobe little dilated, commonly entire; raceme few (5 to 11)-flowered, on a peduncle 3 to 7 in. long; flowers 10 lines long, white, veined with purple; lower calyx-teeth lanceolate, subequal, longer than tube; pod 2 in. long, 4 lines broad; seed with a small aril.—(*L. Californicus* Wats.)

Foothills of the inner Coast Ranges and sandy ridges of the Sacramento Valley bordering them; Sierra Foothills; also Mendocino Co., Sonoma, and Carmel Mission acc. to Watson in Gray Herbarium.

Mar. Distinguished from *L. Bolanderi* by its much smaller and narrower stipules, by its leaflets which are acute at both apex and base, and by the strong straight nerves from or near the base, which proceed much above the middle of the leaflet.

6. *L. Jepsonii* Greene. Herbage glabrous; stems 4 to 6 ft. high, strongly winged along the angles, the wings herbaceous but often callous-margined; leaflets 8 to 12, linear-lanceolate, mostly $1\frac{1}{2}$ in. long, markedly venulose; stipules semi-sagittate, both the apical and basal lobes lanceolate; peduncles mostly shorter than the leaves; corolla rose-purple, 9 lines long; lower calyx-teeth unequal, the middle one equaling the tube.

Suisun Marshes. Aug.-Sept.

10. LOTUS L.

Annual or perennial herbs, some slightly suffrutescent. Leaves pinnate, of 1 to many leaflets, with foliaceous, scarious, or gland-like stipules. Flowers in terminal or axillary umbels, or solitary and axillary. Corolla yellow, reddish or whitish, sometimes pink-tinged or marked with purple. Calyx-teeth nearly equal. Stamens diadelphous, free from the petals; anthers all alike. Style incurved. Pod flattened or terete, sessile, 2 to commonly several-seeded, often septate between the seeds, dehiscent or indehiscent. (A Greek name.)

A. Pods dehiscent.

Flowers and pods erect or somewhat diverging, at least not reflexed.

Stipules large, foliaceous or scarious; leaflets mostly equally distributed on the opposite sides of the rachis; pods linear-elongated and straight, tardily dehiscent; perennials.

Stoutish; bract borne somewhat below the umbel; claws of the petals sometimes obviously exerted from the calyx.

Glandular-hispidulous and viscid; leaflets 11 to 21, thinnish 1. *L. stipularis*.

Nearly glabrous, glaucous, not viscid; leaflets 9 to 11, thick 2. *L. crassifolius*.

Slender; bracts borne at the umbel; claws of the petal conspicuously exerted from the calyx; banner yellow.

Puberulent; wings white 3. *L. Torreyi*.

Glabrous; wings pink or rose-color 4. *L. formosissimus*.

Stipules gland-like; leaflets commonly unequally distributed on the opposite sides of the rachis; pods readily dehiscent.

Flowers many in a capitate umbel; leaflets 3 to 9; perennial.

Tall, 1 to 5 ft. high; flowers yellow, turning orange. 5. *L. grandiflorus*.

Low, the branches half-prostrate or ascending, as much as 18 in. long, but seldom over 5 or 6 in. high; flowers yellowish white, turning red-purple 6. *L. leucophæus*.

Flowers 1 to several, on an elongated bracted peduncle; rachis (except in nos. 9 and 10) conspicuously dilated; annuals.

Peduncle 2 to 5-flowered; keel obtuse; leaflets commonly 7. 7. *L. salsuginosus*.

Peduncle 1 or 2-flowered; keel obtuse; leaflets 5 to 9 8. *L. strigosus*.

Peduncle 1-flowered; keel acute; leaflets 1 to 5.

Corolla twice as long as the calyx; pods constricted between the seeds; leaflets mostly 3 or 4; herbage glabrous 9. *L. micranthus*.

Corolla scarcely exceeding the calyx; pods not constricted; leaflets 1 to 4, mostly 3; herbage villous-pubescent . 10. *L. Americanus*.

Flowers solitary, short-pedicel, not bracted; keel acutely beaked; corolla much exceeding the calyx; annuals.

- Calyx-teeth linear, much longer than the tube; pods oblong, 2 or 3-seeded 11. *L. humistratus*.
 Calyx-teeth equaling the tube; pods linear, 5 to 7-seeded: var. *Wragelianus* of 12. *L. subpinnatus*.

B. Pods indehiscent.

Flowers and pods reflexed; umbels short-peduncled or sessile; leaflets 3 to 5, rarely 6; stipules gland-like; pods long-pointed and often arcuate, 1 or 2-seeded; claws of the petals sometimes obviously exerted from the calyx-tube.

Annuals, mostly prostrate; leaflets 5 to 7;

Calyx densely tawny-villous; stems simple 14. *L. eriophorus*.

Calyx hirsute with whitish hairs; stems much branched 13. *L. Heermannii*.

Perennials.

Umbels sessile; calyx-teeth subulate, erect; leaflets mostly 3; tufted and reedy-looking plant, the foliage scant. 15. *L. glaber*.

Umbels peduncled.

Calyx-teeth subulate, recurved; habit and leaves similar to the last. 16. *L. Benthami*.

Calyx-teeth triangular, blunt; leaflets usually 4 17. *L. Biolettii*.

1. *L. stipularis* (Benth.) Greene. Erect, $1\frac{1}{2}$ to 2 ft. high; the herbage glandular-hispidulous and glutinous; leaflets 11 to 21, obovate or elliptic-oblong, obtuse or acute, mucronate, $\frac{1}{2}$ to 1 in. long; stipules large, ovate-acuminate; peduncles much shorter than the leaves, 5 to 10-flowered, with 3-foliolate petioled leaf-bract near the umbel; corolla whitish or yellowish, with purple marks, 5 lines long, the calyx rather more than $\frac{1}{2}$ as long, its teeth broadly subulate, $\frac{1}{3}$ as long as the tube; pod not known to us.—(*Hosackia stipularis* Benth. *Hosackia balsamifera* Kell.)

Sonoma to Alameda Cos. and Monterey; first collected by Douglas. The type of Kellogg's *Hosackia balsamifera* was collected on "summits back of Oakland," July 31, 1866, by Kellogg, who described it as glandular-fragrant.

2. *L. crassifolia* (Benth.) Greene. Erect, stout, glaucous (or seemingly so) and somewhat pubescent; stems often clustered, 2 to 3 or 5 ft. high; branches comparatively few, often flexuous; leaves 4 in. long or more; leaflets 9 to 11, occasionally 8 or 12, sometimes inequilaterally distributed, elliptic or slightly rhomboidal, almost coriaceous, 10 to 12 lines long, on petiolules often 1 line long; stipules ovate or roundish, scarious; peduncles shorter than the leaves, bracted above the middle with a 3-foliolate petioled leaf and bearing an umbel of 7 to 12 flowers on slender pedicels; calyx $2\frac{1}{2}$ lines long, with very short acute teeth; corolla greenish yellow or whitish, marked with purplish spots, twice as long as the calyx, which is scarious in fruit; pods terete, 2 to $2\frac{1}{2}$ in. long, 2 to 3 lines in diameter, 7 to 12-seeded; seeds nearly 2 lines long.—(*Hosackia crassifolia* Benth.)

Mountainous country, in dry places. Coast Ranges, towards the interior: Mt. Diablo, Vaca Mountains, etc. Mt. Shasta. Sierras. June-July. First collected by Douglas in California.

3. *L. Torreyi* (Gray) Greene. Stems erect, slender, 1 or 2 ft. high; leaves with a fine indument; leaflets 7 to 9, obovate or oblong, 9 to 12 lines long; stipules triangular-lanceolate; peduncles longer

than the leaves, 2 to 6 in. long; umbels 7 to 9-flowered, the 1-foliate bract 3 to 6 lines long; flowers nearly $\frac{1}{2}$ in. long; claws of the petals exerted from the calyx (as also in the next); keel and wings white; keel obliquely incurved at apex; calyx-tube a line long, the subulate teeth nearly as long; pod slender, 1 to $1\frac{1}{2}$ in. long.—(*Hosackia Torreyi* Gray.)

Along streamlets and in low moist meadows of the Coast Ranges: Howell Mountain. Also in the Sierras. June.

4. **L. formosissimus** Greene. Herbage glabrous and light green; stems several from a soft and much thickened taproot, decumbent, 5 to 12 in. long; leaflets 5 to 7 (or 8), the lower deltoid-obovate and truncate or retuse, the upper obovate-oblong, 4 to 6 lines long; peduncles 1 to $1\frac{1}{2}$ in. long; umbels 4 to 6-flowered, the bract 3-foliate and petioled; flowers exceeding $\frac{1}{2}$ in. long; calyx 3 lines long, its teeth triangular-acuminate, $\frac{1}{3}$ as long as the tube; banner yellow, with an obvious upturned thickened process at base of blade on each side; wings pink-tinged or rose-red; keel yellow, purple-tipped; pod straight, $1\frac{1}{4}$ in. long, scarcely more than 1 line broad.—(*Hosackia gracilis* Benth.)

Common in moist ground along the seaboard: Monterey, *Brewer*; Lake San Andreas, *Davy*; Crystal Springs, *Eastwood*; Bolinas, *Chesnut* and *Drew*; Mendocino, *Bolander*. A beautiful species, flowering in Apr. First collected by Menzies in California.

5. **L. grandiflorus** (Benth.) Greene. Tall and stout, 1 to 3 ft. high, appressed silky-pubescent or nearly glabrous; leaflets 5 to 7 or 8, on an elongated rachis, obovate to oblanceolate, acute, 6 to 9 lines long; peduncles elongated, bearing a 3 to 8-flowered umbel commonly subtended by a 1-foliate bract; flowers nearly sessile, bright yellow, turning orange, 7 to 9 lines long; banner 4 lines broad; calyx-teeth broadly subulate; pod slender, $1\frac{1}{2}$ in. long, reddish brown, the margin of the valves with a whitish or callous line.—(*Hosackia grandiflora* Benth.)

Coast Range ridges from Mendocino Co. to Santa Monica. First collected by Douglas.

6. **L. leucophæus** Greene. Perennial, with pubescent or even velvety herbage, the stems from a woody subterranean base, diffusely spreading or ascending, 10 to 15 or 18 in. long; internodes short; leaves ample; leaflets mostly 6, elliptic and obtuse or for the most part obovate and shortly acute, 6 to 8 lines long; peduncles equaling or exceeding the leaves; umbel with a 1-foliate bract, 5 to 8-flowered; flowers exceeding $\frac{1}{2}$ in., yellowish white, changing to red-purple; banner 3 lines broad; calyx 4 lines long, its lobes subulate-lanceolate, nearly as long as the tube; pod 1 in. long and 1 line wide.

High dry ridges: Mt. Diablo Range acc. to Greene; inner North Coast Range (Vaca Mountains), *Jepson*. June. Seemingly of no more than varietal value.

7. **L. salsuginosus** Greene. Minutely strigose-pubescent; stems ascending or prostrate, somewhat succulent, commonly much branched,

9 to 16 or often 24 in. long; leaflets 5 to mostly 7, elliptic- or more commonly oblong-obovate, 3 to 7 lines long; peduncles 1 in. long or less, 2 to 5-flowered, bractless or with a conspicuous 1 to 3-foliolate bract; corolla yellow, 3 lines long, the banner sometimes shorter than the wings and obliquely obtuse keel; calyx-tube $\frac{1}{2}$ to $\frac{2}{3}$ as long as the linear-lanceolate teeth; pod 1 in. long, 10 to 12-seeded; seeds obliquely oval, smooth.—(*Hosackia maritima* Benth.)

Alkaline flats: San Jose, acc. to Greene; Santa Cruz, *M. E. Jones*, and southward to Monterey, Santa Barbara, *Torrey*, and Santa Monica. Mar.—May.

8. *L. strigosus* (Nutt.) Greene. Appressed-hirsutulous; stems branched at the base and decumbent or prostrate; leaflets 7 to 10, oblong or narrowly obovate, 2 to 5 lines long; early peduncles shorter than the leaves, 1-flowered, bractless; later peduncles often longer than the leaves, frequently 2-flowered and bracted; flowers 3 or 4 lines long, yellow; calyx $\frac{1}{2}$ as long, its teeth triangular-acuminate; pod 1 in. long or somewhat less, 9 to 14-seeded; seeds quadrate, deeply notched at the hilum, minutely granulate, $\frac{1}{2}$ line long.—(*Hosackia rubella* Nutt.)

Alameda, San Francisco and southward. Apr.—Nov. The var. *NUDIFLORUS* (*Hosackia nudiflora* Nutt.), with pods $1\frac{1}{2}$ times as broad and slightly curved upward at apex and flowers 5 lines long, occurs in the Mt. Diablo Range. *Lotus hirtellus* Greene, "canescently-hirsutulous," "peduncles 2-flowered," Mt. Diablo Range near Livermore, is, doubtless, of no value specifically.

9. *L. micranthus* Benth. Annual, glabrous and glaucous, the stems very slender, 1 or 2 from the base and erect, or rarely with many diffuse or ascending branches; leaflets 3 to 5, mostly 4 with one leaflet terminal and two on one side of the rachis and one on the other, obovate to oblong, 2 to 5 lines long; peduncles filiform, shorter than the leaves, 1-flowered, bracted, 1 to 6 lines long, or in fruit as much as 1 in. long; flowers minute, pale salmon, turning red; corolla twice as long as the calyx, the teeth of the latter commonly shorter than the tube; pod 7 to 10 lines long, linear, compressed, constricted between the oval or roundish smooth seeds.—(*Hosackia parviflora* Benth.)

Common in the Coast Ranges on grassy hills, the plants, where found, numerous and growing closely together: Napa Co.; Sonoma Co.; Mt. Tamalpais; Mt. Diablo and southward to Monterey. Apr.—May.

10. *L. Americanus* (Nutt.) Bisch. SPANISH CLOVER. Annual, more or less silky-villous or pilose-pubescent, strictly erect and nearly simple, or more commonly very diffusely branched with straggling or ascending stems 2 or 3 ft. long; leaflets 1 to mostly 3, ovate to oblong, acute or obtusish, 3 to 10 lines or the lower 1 in. or more long; peduncles exceeding the leaves, the solitary whitish or pinkish flower subtended by a bract 2 to 4 lines long; calyx-teeth subulate-linear, longer than the short tube, almost equaling the (2 to 3 lines

long) corolla; pod narrowly linear, glabrous, about 1 in. long, 5 to 7-seeded; seeds oblong, smooth, dark colored.—(*Hosackia Purshiana* Benth.)

Banks of streams, dry hillsides, or on the level lands of the valleys and plains; very common and widely distributed, conspicuous in the late summer and fall months.

11. *L. humistratus* Greene. Herbage soft-villous, branches from the base decumbent, or ascending, or more often prostrate and forming mats 5 to 9 in. broad; leaflets 4, narrowly oblong or cuneate-obovate, 3 to 5 lines long, the rachis over $\frac{1}{2}$ line broad; flowers sessile, or nearly so, yellow, 3 or 4 lines long; calyx-teeth linear, much longer than the tube; wings at base of blade joined above ovary as in the next; pod oblong, pilose, 4 lines long, 2 or 3-seeded.—(*Hosackia brachycarpa* Benth.)

Abrupt sunny hillsides in clayey soil; Coast Ranges and Sierras. Less common than the next.

12. *L. subpinnatus* Lag. var. *Wrangelianus*. Annual, low, diffusely branched, 4 to 7 in. high; herbage sparsely pubescent with short hairs, canescently villous, or nearly glabrous, especially on the upper surface of the leaflets; foliage similar to the preceding; flowers distinctly pediceled, bright yellow, 4 to $4\frac{1}{2}$ lines long; calyx-teeth broadly subulate, as long as the tube; wings joined on the upper side of the ovary by the lobes or processes at the base of the blade, their tips meeting above the keel, but not enfolding it; pod pubescent, linear, 7 to 9 lines long, 5 to 7-seeded.—(*L. Wrangelianus* F. & M.)

Common in the hill country from the outer (or seaward) to the inner Coast Ranges. Apr.-May. Probably ours is not even varietally distinct from the type, which is Chilean and exhibits variations similar to the plant of California.

13. *L. Heermanni* (Dur. & Hilg.) Greene. Very near the next, less pubescent, the pubescence whitish, the herbage of a light green; stems prostrate, several from the root, 2 to 3 ft. long, with long branches throughout their length; leaflets somewhat broader and more acute; flowers one-half as large; calyx hirsute with whitish hairs; corolla yellow turning to deep red.—(*Hosackia Heermanni* Dur. & Hilg.)

Soquel Cañon, Santa Cruz Mountains, *Jepson*, June, 1896; first collected in Tejon Pass at the head of the San Joaquin Valley by Williamson's Expedition, Pacific Railroad Survey.

14. *L. eriophorus* Greene. Annual, villous-pubescent or somewhat tomentose; stems numerous from the base, simple, often prostrate and almost matting the ground, about 1 ft. long, leaflets 5 to 7, obovate and often cuneate to cuneate-oblong, mostly acutish and mucronulate, 3 to 5 lines long; umbels 5 to 7-flowered, nearly sessile; flowers yellow, turning brownish, $3\frac{1}{2}$ lines long; calyx $\frac{1}{2}$ as long, very densely villous and tawny, the filiform teeth about equaling the tube; body of pod 2 or 3 lines long, the long-pointed portion as long.—(*Hosackia tomentosa* H. & A., and *H. Heermanni* Brew. & Wats. Bot. Cal. as to San Francisco Co.)

San Francisco and southward along the coast. Apr.-Sept. Stem covered with spreading hairs, whereas in the next, the stems are comparatively glabrous.

15. *L. glaber* (Vogel) Greene. DEER-WEED. Very nearly glabrous, the calyx and young leaves often somewhat appressed-silky; stems woody at base, tufted and reed-like on account of the sparse foliage, 2 to 5 ft. high, erect with straggling branches, or sometimes decumbent; leaflets mostly 3, on young shoots 4 to 6, oblong to linear-oblong, 3 to 6 lines long, obtuse or acute; umbels numerous, sessile; flowers 3 or 4 lines long, yellow, turning red; calyx about 2 lines long, its teeth subulate, erect, about $\frac{1}{3}$ as long as the tube.—(*Hosackia glabra* Torr.)

Common everywhere in the Coast Ranges in the hill country: Solano and Napa Cos. southward to San Diego. June-Sept.

16. *L. Benthami* Greene. Similar to the preceding; umbels on peduncles equaling or exceeding the leaves, usually 1 to 3-foliolate bracted; calyx-teeth subulate, sometimes recurved.—(*Hosackia cytisoides* Benth.)

San Francisco, *Barclay*, and southward to Monterey and the Salinas Valley. First collected by Douglas.

17. *L. Biolettii* Greene. Herbage ashy or whitish with short appressed hairs; branches slender, wiry and prostrate, 1 to 2 ft. long; leaflets usually 4, cuneate-obovate, obtuse, 2 to 5 lines long; peduncles scarcely surpassing the leaves, the umbel 6 to 10-flowered and 1-foliolate bracted; calyx a line long or less, the triangular blunt teeth erect; corolla 2 lines long, yellow, changing to dark red; pod strongly arcuate, slender beaked.

Dry ridges, Marin Co.

11. TRIFOLIUM L. CLOVER.

Herbs with palmately (sometimes pinnately) 3-foliolate leaves. Stipules united with the petioles and leaflets toothed or entire. Flowers white, yellow, red or purplish, in heads or very short spikes. Calyx 5-toothed or -cleft. Petals more or less united below by their claws with the stamen-tube, mostly withering and persistent. Stamens diadelphous, the teeth more or less separate. Pod often included in the calyx, 1 to 6-seeded, indehiscent or opening by one suture only. (Latin tres, three, and folium, leaf.)

A. Heads not subtended by an involucre.

Flowers nearly or quite sessile; calyx-teeth plumose or at least hairy.

Annuals.

Heads sessile 1. *T. Macraei*.

Heads peduncled and

Few and large, commonly 1 to 3; plants stout and simple or with 1 or 2 forks at summit; interior plains 2. *T. amenum*.

Several to many.

Calyx-segments shorter than the corolla or often somewhat surpassing it; flowers purplish.

Heads cylindrical, 8 to 10 lines long, mostly with turbinate base 3. *T. dichotomum*.

Heads ovate, 3 to 8 lines high 4. *T. albopurpureum*.

Calyx-segments very much longer than the corolla and often so plumose as to quite conceal it; heads dove-colored or olive-green, ovate, with broad truncate base or more hemispherical in the vars. 5. *T. columbinum*.

Perennial; calyx-teeth sparingly hairy; flowers red. 6. *T. pratense*.

Flowers pedicellate, at length reflexed; calyx-teeth subulate or setaceous, not plumose.

Calyx-teeth rigid-ciliate; pod 1-seeded 7. *T. ciliolatum*.

Calyx-teeth not ciliate.

Leaflets narrow as compared with the next; the notch at apex mucronulate; rachis not prolonged, or appearing only as a minute point; pod 1-seeded 8. *T. bifidum*.

Leaflets obcordate, the notch at apex usually not mucronulate; rachis prolonged through the head as a sterile point about 3 lines long; pod 2-seeded 9. *T. gracilentum*.

B. Heads subtended by an involucre, or by a mere ring in no. 21.

Corolla not becoming inflated.

Involucre cup-shaped, not deeply lobed, membranous at least at base; flowers developing equally all around.

Lobes of the involucre toothed; teeth of the calyx much shorter than the tube 10. *T. microdon*.

Lobes of the involucre entire; teeth of calyx longer than the tube. 11. *T. microcephalum*.

Involucre flat, rather deeply lobed, the lobes laciniately toothed; flowers commonly blooming first on one side and the heads therefore one-sided.

Annuals.

Herbage mostly glabrous.

Calyx-teeth entire.

Stems decumbent or ascending; leaves obovate or oblong-oblancoleate; heads mostly 3 to 6 lines broad 12. *T. variegatum*.

Stems erect, these and the peduncles almost filiform; leaves linear; heads 2 to 3 lines broad 13. *T. oliganthum*.

Calyx-teeth not entire 14. *T. tridentatum*.

Herbage soft-pubescent and clammy; flowers whitish.

15. *T. obtusiflorum*.

Perennial; herbage glabrous; flowers rose-color; banner elliptical, deeply emarginate 16. *T. Wormskjoldii*.

Corolla conspicuously inflated in age, the petals withering-connivent by their apices and forming a bladder-like sac to the growing pod.

Involucre broad, setaceous many-toothed; calyx-teeth awn-like, plumose; corolla red-purple.

Peduncles $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; involucre shallowly lobed, glabrous 17. *T. barbigerum*.

Peduncles 3 to 7 in. long; involucre pubescent, deeply lobed 18. *T. Grayi*.

Involucre deeply parted into entire lobes; calyx-teeth not plumose.

Involucral lobes 3 to 9 (commonly about 6) lines long; heads large; flowers cream-color or yellowish; pod stipitate; seeds nearly smooth 19. *T. fucatum*.

Involucral lobes 2 lines long or less; heads small, $\frac{1}{2}$ in. in diameter or less; flowers purple, reddish or white; pod sessile; seeds tuberculate or rugose 20. *T. amplexens*.

Involucre obsolete or reduced to an entire or slightly lobed herbaceous ring; leaflets serrate (or laciniate-toothed in one of the vars.) 21. *T. depauperatum*.

1. *T. Macraei* H. & A. Plant much branched, the branches decumbent or almost prostrate, 4 to 6 in. long; herbage villous-pubescent; leaflets cuneate-oblong, obtuse, denticulate above the middle, 3 to 5 lines long; heads nearly or quite sessile, solitary or often occurring as a terminal pair, ovate, 4 or 5 lines high; calyx-

teeth longer than the tube, densely plumose-hairy, nearly equaling the small purplish corolla; pod 1-seeded.

San Francisco; Pacific Grove, *H. P. Chandler*; also in Chile, whence perhaps introduced. Nearly related to *T. albopurpureum*.

2. *T. amœnum* Greene. Stout, simple and 1-headed, or once or twice forked above and bearing 2 to several terminal or subterminal heads; herbage soft-pubescent; leaflets broadly obovate, obtuse or retuse at apex and often cuneate at base, less than 1 in. long; stipules ovate, acuminate, the uppermost broader, some unequally notched at apex and with a long setaceous acumination borne in the notch; heads globose, exceeding 1 in. in breadth; calyx-teeth shorter than the purple and white corolla, densely clothed with dull brownish hairs.

Solano Co. plains between Suisun and Elmira. May-June.

3. *T. dichotomum* H. & A. Stems dichotomously branching or the branches mostly from the base, 10 to 16 in. high, the internodes very long; herbage almost glabrous or appressed-pubescent, the leaves more pubescent than the stems; leaflets elliptic or cuneate-obovate, denticulate towards the apex, 3 to 8 lines long, on petioles 2 in. long; stipules ovate, with a short subulate point; peduncles elongated, 7 in. long or less; inflorescence a short cylindrical spike, turbinate at base, 8 to 10 lines long or more; flowers showy, purple and white, 5 lines long; calyx-teeth silky, long and slender, nearly or quite as long as the corolla; pod 1-seeded.

Coast Ranges, rare in typical form but more frequent on the higher than on the lower hills: Ukiah; Calistoga; Conn Valley near St. Helena; upper Vaca Valley. Apr. Passes into the next species.

Var. *turbinatum*. Erect, commonly simple, 4 to 6 in. high; heads narrowly or broadly turbinate, about $\frac{1}{2}$ in. high.—Hillsides at Ross Valley.

4. *T. albopurpureum* T. & G. Ascending or erect, 4 to 14 in. high; leaflets oblong-obovate, less frequently broadly obovate, denticulate towards the apex, obtuse or emarginate, 6 to 10 lines long; heads ovate-conical, 3 to 8 lines high, solitary at the ends of very long slender peduncles; calyx-teeth slender, delicately plumose, equaling or exceeding the white-tipped purple corolla, which is far less showy than in the last.—(*T. Macraei* H. & A. var. *albopurpureum* Greene.)

Everywhere common in the Coast Range region, especially on the lower hills. Variable.

5. *T. columbinum* Greene. One ft. high, sparingly branched; leaflets cuneate-oblong, 1 in. long or less; heads ovate with a broad and often truncate base, 1 in. high, dove-color; calyx-tube 1 line long, the filiform segments 5 lines long, silky-plumose throughout, sometimes partly concealing the small purple corolla; pod striate, villous at apex.

Rare in the typical form: low hills of northwestern Solano Co. Apr.-May. Appearance suggestive of the Rabbit's Foot Clover, *T. agrarium* L., of the eastern United States.

Var. argillorum. Depauperate; heads about $\frac{1}{2}$ in. high, the teeth less silky and relatively shorter.—Hills and mountain slopes of the North Coast Ranges, seemingly joining with no. 4.

Var. olivaceum (T. olivaceum Greene). Mostly erect, 1 to $1\frac{3}{4}$ ft. high, slightly pubescent; leaflets cuneate-obovate, often exceeding 1 in.; heads globose, $\frac{3}{4}$ in. high, of an olive-green color, long-peduncled; calyx-tube 1 in. long, its teeth long-setaceous and short-silky, the rigid point almost naked; corolla violet-purple, small and in the robust forms almost concealed; pods glabrous.—Formerly abundant on the plains and valleys of northwestern Solano Co., forming an important part of the hay crop in some localities; now seldom seen or only in depauperate form. Possibly of hybrid origin. May.

6. T. pratense L. RED CLOVER. Glabrous below, pubescent above, 2 ft. high or less, branching; leaflets elliptic or obovate, 1 in. long; stipules entire, bristle-pointed; heads ovate, 1 in. high or nearly so, sessile; calyx-teeth setaceous, exceeding the red flowers, sparingly hairy.

Well-known cultivated species from Europe: naturalized in the moister parts of northern California and seemingly spontaneous on the islands of the Lower Sacramento. July–Oct.

7. T. ciliolatum Benth. Erect, 8 to 18 in. (rarely $2\frac{1}{2}$ ft.) high, glabrous; leaflets narrowly or cuneate-oblong to obovate, obtuse or retuse, serrulate, 5 to 12 lines long; stipules broadly linear, acuminate; flowers whitish or purplish, 3 lines long; calyx-teeth lanceolate, very acute, rigidly ciliate, often purplish; pod 1-seeded, oblong-elliptic.

Plains and valleys throughout California: Coast Ranges; Sacramento and San Joaquin Valleys; Sierra Nevada to about 5,000 ft. altitude (Amador Co., Knight's Ferry, *F. W. Bancroft*, Sequoia National Park). Rachis sometimes prolonged through the head as a sterile filament. Apr.–May.

8. T. bifidum Gray. Erect, very slender, 7 to 12 in. high, pale green and glaucous, wholly glabrous or the petioles and peduncles hairy; leaflets linear, oblong, or obovate, more or less cuneate, serrulate, the teeth often remote as compared with the preceding, apex bifid and mucronulate, 6 to 8 lines long; stipules lanceolate, the upper ovate-lanceolate, setaceously acuminate; heads 6 to 15-flowered; calyx deeply 5-parted, the subulate-setaceous teeth rather shorter than the pale pink corolla; pod included, 1-seeded; seeds obovate-oblong.

New Almaden, northward to Berkeley, Mt. Diablo, Vacaville and Ukiah. Apr. Infrequent in the typical form.

Var. decipiens Greene. Stout, with the leaflets less deeply notched and the calyces and peduncles often hairy.—Common: Santa Clara Co.; Berkeley; Sacramento Valley and elsewhere.

9. T. gracilentum T. & G. Erect, 10 to 16 in. high, wholly glabrous; leaflets obcordate, spinulose-serrulate, 5 to 7 lines long; stipules linear, or those of leaves subtending peduncles, ovate, acuminate.

nate; rachis prolonged through the head as sterile point about 3 lines long; flowers 3 or $3\frac{1}{2}$ lines long; calyx-teeth subulate, three times as long as the tube; corolla reddish or deep purple, the ends of the petals more or less definitely white-tipped; pod exserted, 2-seeded; seed obliquely oval, straw-colored.

Common on low hills and in valleys: Los Angeles and San Luis Obispo Cos. northward through the Coast Range region (Alameda, San Francisco, Napa Valley, Solano Co., etc.), ranging beyond the northern boundary of California. Apr.-May.

10. *T. microdon* H. & A. Stems erect or decumbent, stoutish, 8 to 16 in. long, faintly pubescent; leaflets broadly obcordate, serrulate, 6 lines long; heads 4 lines broad; involucre 12 to 15-lobed, the lobes 3 to several-toothed and spreading abruptly from the head after anthesis; calyx-teeth short, $\frac{1}{3}$ or $\frac{1}{4}$ the length of the tube; corolla white, fading pinkish.

Plains of the San Joaquin and Sacramento; valleys of the Coast Ranges (Alameda Co., Mt. Tamalpais, Napa Valley and northward). Apr.

11. *T. microcephalum* Pursh. Stems slender, erect or decumbent, 3 in. to even 2 ft. long; herbage soft-pubescent; leaflets obovate, serrulate, notched at apex, stipules ovate, acuminate; heads 3 lines broad; involucre about 9-lobed, the lobes erect, acuminate, cuspidate, entire, 3-nerved; calyx-teeth longer than the tube, spinulose at apex, margined at base with a broad often denticulate or scarious border which is more or less protruded; corolla white or light rose-color, scarcely exceeding the calyx-teeth; pod globose, 1-seeded.

Hill-sides and valleys: North Coast Ranges (Vacaville and St. Helena) southward to San Francisco, Pacific Grove and Southern California. Apr.

12. *T. variegatum* Nutt. Glabrous annual; stems slender, decumbent or ascending; leaflets obovate to oblong-ob lanceolate, obtuse or retuse, spinulose-serrulate, 4 to 10 lines long; stipules oblong- or ovate-lanceolate, sharply toothed or laciniate; peduncles slender, longer than the leaves; involucre laciniate, shorter than the heads; heads small (3 to 15-flowered and $\frac{1}{2}$ in. broad or less); calyx-tube 15-nerved, its teeth subulate-setaceous, entire, shorter than the deep purple or whitish corolla but longer than the tube; pod 2-seeded.

Common in low moist ground, throughout California. Apr.-May. Greene has a var. *melananthum*, the calyx-teeth more triangular and only pungently acute or acuminate and of a dark purple almost to the base; and also a var. major, very large, stout and fistulose, with cuneate-oblong leaflets, heads 1 in. broad, and petals purple with white tips.

13. *T. oliganthum* Steud. Pale green, glabrous annual; stems erect, very slender, simple or with a few ascending branches, 7 to 15 in. high; upper leaflets linear, acute, $\frac{3}{4}$ to 1 in. long, spinulose-serrate or nearly entire; lower leaflets cuneate-oblong or -obovate, 2 or 3 lines long; petioles very slender; stipules lanceolate, laciniate;

peduncles filiform, 2 to 3 in. long, exceeding the leaves; heads very small, 2 or 3 lines broad, 5 to 11-flowered; involucre reduced, laciniately divided; flowers pale purple and white, 2 to 3 lines long; calyx often purplish; calyx-teeth oblong-lanceolate, pungent, entire, shorter than the 10-nerved tube.

Brush-covered or wooded cañon sides or edges of thickets in the Coast Range hills: Berkeley; San Pablo Creek; near St. Helena. Apr. Greene has a var. *Sonomense*, found in Knight's Valley, Sonoma Co., with broader cuneate-oblong truncate cuspidate leaflets and subulate-aristate calyx-teeth equaling or exceeding the tube. Also a var. *triflorum*, found in the Mt. Diablo region, with broader retuse leaflets, fewer flowers and triangular-acuminate calyx-teeth $\frac{3}{4}$ as long as the tube.

14. **T. tridentatum** Lindl. Glabrous annual; stems usually erect or with decumbent base, 9 to 16 in. or even 2 ft. high; leaflets linear or lanceolate, sharply serrate; heads 1 in. broad or more; involucre laciniate, much shorter than the flowers; corolla bright purple, often tipped with white; calyx-tube strongly 10-nerved, longer than the teeth; these broad at base and abruptly narrowed into a subulate spine, usually with a stout tooth on each side.

Very common on hills and plains from the Sierra Foothills and the Sacramento and San Joaquin Valleys westward to the seaboard and southward to Southern California. The following is a little-known plant whose exact status has not been determined:

T. APPENDICULATUM Loja. Branches almost prostrate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, sometimes forming a very broad mat; leaflets broadly obovate and truncate, or obcordate, cuneate at base, 7 to 12 lines long; peduncles about 3 in. long, twice exceeding the leaves (but the lower leaves as long); heads large and involucre comparatively small; calyx-teeth subulate-aristate, entire, twice as long as the tube; banner deeply emarginate, keel abruptly contracted at apex into a slender tip. (Not *T. appendiculatum* Greene).—Moist fields, Napa Valley. May 12, 1895, *Greene*.

15. **T. obtusiflorum** Hook. Diffusely branching, the stems stout, purplish, 1 to 2 ft. long; herbage soft-pubescent throughout and very clammy; leaflets linear or oblong-lanceolate, pectinately serrate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; heads 1 in. or more broad, on long (often $4\frac{3}{4}$ in.) peduncles; calyx minutely roughish puberulent, its tube oblong-campanulate, with 10 primary and as many intervening lesser nerves, the latter vanishing above or forming reticulations; teeth subulate-spinose, entire or sometimes slightly toothed, nearly equaling the tube or scarcely $\frac{1}{2}$ as long; corolla white, with a dark purple spot at the center.—(*T. roscidum* Greene.)

Sandy stream beds in cañons: Horse Mountain, Lake Co.; Vaca Mountains, Solano Co., where it is a very rare plant; Mt. Tamalpais; Mt. Diablo Range; and southward to Southern California. Easily recognized by its clamminess, the whole plant on the driest summer day seeming to the touch as if wet with dew.

16. **T. Wormskjoldii** Lehm. Perennial by spreading root-stocks;

herbage glabrous and flaccid; stems decumbent, stout, sometimes fistulose, 5 to 17 in. long; leaflets obovate-oblong, obtuse, pectinate-denticulate, $\frac{3}{4}$ to 1 in. long; heads hemispherical, 1 in. broad; involucre 6 to 9 lines broad, laciniately cleft, the tooth-like segments aristate; flowers rose-color; calyx-tube scarious, 10-nerved, the alternate nerves less prominent; teeth gradually attenuate, longer than the tube, all entire, or some of them setaceously divided; banner elliptical, deeply emarginate.

Rather frequent along streams or about springy places or bordering the edges of salt-marshes: Howell Mountain; Denverton; San Francisco. May-June.

17. **T. barbigerum** Torr. Prostrate or ascending, the branches 2 to 4 in. long; petioles and peduncles pubescent; leaflets elliptic-obovate to obovate-oblong, retuse or obtuse, 3 to 5 lines long; stipules scarious, broadly ovate, laciniate; involucre as broad as heads, shortly lobed and setaceously many-toothed; heads 4 to 5 lines wide; peduncles long ($1\frac{1}{2}$ to $2\frac{3}{4}$ in.); calyx-tube short, thin and at length scarious; teeth setaceous-awned from a short triangular base, plumose, sometimes 2 to 3-parted, the lower usually exceeding the purple corolla; pod 2-seeded.

San Francisco southward to Santa Cruz. Not common. May.

18. **T. Grayi** Loja. Erect or ascending, 8 to 16 in. high, villous with spreading hairs; leaflets obovate to cuneate-oblong, obtuse or acute, sharply serrate, 9 to 12 lines long; heads long-peduncled, nearly or fully 1 in. broad; involucre as broad as heads, deeply lobed and setaceously toothed; calyx-tube villous, 10-nerved; teeth linear-subulate from a triangular base, plumose, frequently reddish, equaling the dark red-purple corolla.

Near the coast but infrequent: San Bruno Hills and northward.

19. **T. fucatum** Lindl. SOUR CLOVER. Diffuse or decumbent, glabrous, somewhat scabrous above, very stout and succulent, much branched, the branches $\frac{1}{2}$ to 2 ft. long; leaflets obovate to inversely deltoid, mostly cuneate at base, pectinate or spinulose-serrate or nearly entire, $\frac{1}{2}$ to 1 in. long; heads very large, 1 to $1\frac{3}{4}$ in. in diameter, about 12 to 20-flowered; calyx-tube campanulate, 1 to $1\frac{1}{2}$ lines long, not longer than the teeth, the two upper teeth very short; corolla cream-color, fading pinkish, 7 to 10 lines long; keel-petals frequently with a dark purple spot; legume with a rather long stipe; seeds nearly smooth.

Common in low and often alkaline fields: Sacramento and San Joaquin Valleys; Coast Ranges (Napa Valley, Oakland, Santa Cruz and Hollister, *Setchell*, and elsewhere). May-June. The calyx is very variable in the relative length of the teeth and tube, and an attempt has been made to separate as species, various dwarf and robust soil forms, the species being obliged for their diagnoses to the calyx character and to the habit. These forms are here named as ecological varieties.

Var. **FLAVULUM** (*T. flavulum* Greene). As large as the species but somewhat more slender; heads smaller; calyx-teeth slender-

subulate, exceeding the tube, the lower much longer; legume sessile.—Higher ground than the species. Var. *VIRESCENS* (T. *virescens* Greene). Smaller plant in every way; two upper calyx-teeth shorter than the tube, the lower twice longer.—Hill country in dry or substerile soil. Var. *GAMBELLII* (T. *Gambellii* Nutt.). Lower calyx-teeth cleft into setaceous segments.—Inner South Coast Ranges.

20. *T. amplexans* T. & G. Branches several to many from the base, mostly diffuse with decumbent or ascending slender branches, 3 to 12 or 15 in. long, glabrous throughout; leaflets oblong-obovate, obtuse, truncate or retuse, cuneate at base, serrulate (mostly towards the apex) and mucronulate, 5 to 8 (or the lowest 2 to 4) lines long; heads 2 to 4 (in fruit 4 to 6) lines in diameter; peduncles longer than the leaves, mostly twice longer; bracts of the involucre 5 to 7, ovate or oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ lines long, commonly entire, but sometimes toothed, strongly nerved; calyx-teeth subulate; corolla red-purple or whitish, in age inflated and ovate or obpyramidal; pod usually 2-seeded; seeds $\frac{1}{2}$ to $\frac{3}{4}$ line long, emarginate at the hilum, sinuose-rugose.—(T. *Franciscanum* Greene.)

A frequent species from the plains of the Sacramento and San Joaquin (especially common in low or alkaline areas), westward through the Coast Range hills to the coast. Apr. Doubtless several worthy varieties could well be named and described, but this species is far less variable than might be supposed from the number of invalid species which have been separated from it. When inhabiting dry, especially adobe soil, the plants are often semi-dwarf, and correspond to the type; on high ground the stems are more commonly wiry and prostrate, in low grounds flaccid and not so slender. Even the rank forms of low ground sometimes show scarious-margined involucre and toothed lobes as in the type. Var. *HYDROPHILUM* (T. *hydrophilum* Greene). Lower leaves narrower than the upper; involucre lobes only $\frac{1}{2}$ line long; calyx-teeth aristiform; inflated corolla oblong.—A rank form found near marshes and ponds, Alameda, etc. The number of involucre lobes and seeds is not peculiar. Connects with the next.

21. *T. depauperatum* Desv. Slender, ascending, 3 to 6 in. high, glabrous; stipules ovate, acuminate, entire; leaflets cuneate-oblong, acute or obtuse or emarginate, $\frac{1}{2}$ in. long or less, denticulate; heads 3 to 10-flowered, long-stalked; involucre greatly reduced to very small truncate lobes or a minute ring; calyx short with narrowly subulate teeth; corolla white or purple, inflated, oblong, 2 to 3 lines long; ovules 2 to 6; pod 1 or 2-seeded, rugose.

Not very common: hills and plateaus of the Mayacamas Range bounding Napa Valley on the east; Alameda. May.

Var. *ANGUSTATUM* (Greene under *T. laciniatum*). Leaves all linear, often truncate, entire or nearly so, $\frac{1}{2}$ in. long; involucre reduced to a mere ring.—Sonoma; Upper Napa Valley.

Var. *LACINIATUM* (T. *laciniatum* Greene). Lower leaflets narrowly cuneate, denticulate, the upper broad, truncate, 3-dentate at apex,

laciniately toothed or pinnatifid; involucre obsolete; flowers 3 to 5.—Alkaline plains: Byron and Bethany in the Lower San Joaquin; Colusa Junction in the Sacramento Valley, *Brandegee* (the foliage curiously diverse, the leaves linear and entire or extravagantly toothed or laciniate).

12. MELILOTUS Juss. SWEET CLOVER.

Annual or biennial herbs with pinnately 3-foliolate leaves and toothed leaflets. Flowers small, yellow or white, in spike-like racemes on axillary peduncles, in bud erect, soon deflexed and not again becoming erect. Calyx 5-toothed, the teeth subulate. Petals falling after flowering, free from the stamen tube. Stamens diadelphous, the upper one entirely free. Pod ovoid, coriaceous, straight, in ours wrinkled, scarcely dehiscent, 1 to 2-seeded. (Greek meli, honey, and lotos, the ancient name of some plant belonging to this family.)

Flowers white; plants 3 to 6 ft. high 1. *M. alba*.
Flowers yellow; plants 1½ to 3 ft. high 2. *M. Indica*.

1. *M. alba* Lam. WHITE MELILOT. Erect, simple below, branching above, 3 to 6 ft. high; leaflets broadly or narrowly oblong, tapering to both ends, or widest above the middle, serrate except at the very base, over ½ to 1½ in. long; flowers white, 2 lines long, in racemes 1 to 2 in. long; standard slightly longer than the wings.

Rare in the Bay Region, occurring only in river beds: San Leandro Creek, *Dary*; Napa River, near St. Helena; common in moist valleys northward. Naturalized from the Old World as also the next.

2. *M. Indica* All. YELLOW MELILOT. Main stem erect, 1½ to 3 ft. high, with many rather spreading branches from above the base; leaflets broadly or narrowly cuneate-obovate, or dentate or serrate but entire below the middle, retuse at apex, 1 in. long or more, those of the lateral branchlets or at the summit smaller; racemes 1½ to 2 in. long, longer than the peduncles; flowers yellow, 1½ lines long; wing and keel petals oblong, the latter slightly broader.

Very common. Apr.—May.

13. MEDICAGO L. MEDICK.

Herbs with pinnately 3-foliolate leaves and usually toothed leaflets. Flowers small, in short spikes or loose heads on axillary peduncles. Corolla falling after flowering. Calyx 5-toothed. Keel obtuse. Stamens diadelphous, the upper one entirely free. Pod small, 1 to several-seeded, incurved or coiled or spirally twisted, and indehiscent. (From the Greek Medike, name given by Diocorides to a plant from Media, perhaps Lucern. All the species have been naturalized from Europe. The Bur Clover damages the fleeces of sheep.)

Perennial; flowers blue 1. *M. sativa*.
Annuals; flowers yellow.

Pod 1-seeded, reniform, smooth 2. *M. lupulina*.
Pod several-seeded, spirally coiled, margined with prickles.

Edge of the pod keeled, not grooved between the prickles; leaflets not
 splotched 3. *M. denticulata*.
 Edge of the pod furrowed between the prickles; leaflets with a large
 inky splotch on the upper face 4. *M. maculata*.
 Pod several-seeded, spirally coiled, unarmed 5. *M. apiculata*.

1. *M. sativa* L. ALFALFA. LUCERN. Perennial from an elongated taproot, erect and smooth; leaflets oblong-obovate or linear-oblong, 8 to 10 lines long; flowers blue (5 lines long), in racemes; pod spirally twisted so as to form 2 or 3 complete rings or coils.

Borders of fields, not common beyond cultivation.

2. *M. lupulina* L. NONESUCH. BLACK MEDICK. Branching from the base into spreading procumbent stems 9 to 18 in. long; leaflets orbicular and more or less deltoid to cuneate-obovate, 4 to 6 lines long; peduncles longer than the leaves (1 to 1½ in. long), bearing a short dense spike of bright yellow flowers; pods reniform, 1-seeded, black when ripe.

Uncommon: Santa Clara Co.; Berkeley. Apr.—May.

3. *M. denticulata* Willd. BUR CLOVER. Branches spreading or procumbent, from a few in. to 2 ft. long; herbage nearly glabrous; leaflets obovate or obcordate; stipules finely toothed; peduncles 3 to 5-flowered, rather longer than the leaves; pods twisted into a spiral of 2 or 3 turns, compressed, reticulated, the thin keeled edge bordered by a double row of more or less hooked or curved prickles.

Very common throughout California, especially on the plains, low hills and in the valleys. Mar.—June, but flowering in moist places at nearly all seasons.

4. *M. maculata* Willd. SPOTTED MEDICK. Very similar to the last species, but the petioles with spreading hairs, the leaflets usually much larger (1 in. long) and with a conspicuous dark splotch in the center; pod compactly spiral with thicker margin more or less furrowed between the prickles.

Known only from a few localities in the Bay Region: Oakland; Berkeley; Ross Valley, Marin Co.; but in San Francisco Co. almost as common as no. 3 acc. to Mrs. K. Brandegee.

5. *M. apiculata* Willd. Stems spreading, 1 to 2 ft. long; leaflets deltoid, denticulate, except at the base, usually retuse and mucronate at apex, 5 or 6 lines long; pod unarmed, the sides strongly reticulated, the reticulations running to the edge and appearing as a row of tubercles on either side of the margin.

Seldom collected: Santa Clara Co.; San Francisco; Point Isabel; and in the Sacramento Valley at Redding. Mar.—Apr.

14. LUPINUS L. LUPINE.

Herbs or low shrubs with palmately 4 to 15-foliate leaves. Stipules adnate to the base of the petiole, seldom conspicuous. Flowers showy, blue, pinkish, yellow or white, in terminal racemes or spikes. Calyx deeply bilabiate. Banner roundish, the sides mostly reflexed; wings commonly connivent by their edges in front of and thus enclosing the mostly falcate pointed keel. Stamens

monadelphous, dimorphous, 5 with longer and basifixed anthers, the alternate 5 with shorter and versatile ones. Pod somewhat flattened, often constricted between the seeds. Cotyledons thick and fleshy. (Latin *lupus* a wolf, these plants thought to rob the soil of its fertility.)

A. Pods linear or oblong.

Bracts deciduous; ovules several; cotyledons of the seedling petioled.

Low shrubs or at least suffrutescent, silky pubescent; petioles mostly short.

Flowers sulphur-yellow; raceme often 1 ft. long. . . . 1. *L. arboreus*.

Flowers not yellow, mostly blue.

Herbage greenish; flowers blue or white; keel ciliate for its whole length; low, the stems merely suffrutescent. . . . 2. *L. variicolor*.

Herbage silky.

Flowers bluish or lavender, the banner with a yellow spot; keel glabrous; no distinct trunk. 3. *L. Chamissonis*.

Flowers blue; keel ciliate; shrub with a distinct trunk. 4. *L. albifrons*.

Perennial herbs.

Leaflets 5 to 7, more or less ciliate or ciliolate.

Herbage canescently silky.

Leaflets oblanceolate or cuneate-oblong; roots large, yellow; seashore species. 5. *L. littoralis*.

Leaflets spatulate-oblong; root not yellow; montane species. 6. *L. sericatus*.

Herbage greenish, comparatively glabrous; montane or of the hills. 7. *L. latifolius*.

Leaflets 7 to 9, linear-lanceolate, 1 to 1½ in. long; keel glabrous; plants mostly decumbent, with silky herbage. 8. *L. formosus*.

Leaflets 9 to 16, lanceolate or oblanceolate, 3 to 6 in. long; petioles ½ ft. long or more; plants erect, 3 to 5 ft. high, sparingly villous. 9. *L. polyphyllus*.

Annual herbs.

Flowers mostly 4 to 7 lines long; upper calyx-lip cleft or bifid.

Lower calyx-lip 3-toothed or entire; leaflets cuneate-obovate, obtuse or emarginate; plants very stout and succulent. . . . 10. *L. affinis*.

Lower calyx-lip 3-dentate; leaflets oblanceolate, acute, plant slender, not succulent. 11. *L. nanus*.

Flowers mostly 1½ to 3 lines long.

Slender plants; upper calyx-lip with divergent lobes.

Lower calyx-lip long, entire. 12. *L. micranthus*.

Lower calyx-lip deeply 3-cleft. 13. *L. trifidus*.

Stoutish plants; upper calyx-lip bifid, the ovate segments short and parallel; lower calyx-lip entire or slightly dentate. 14. *L. polycarpus*.

B. Pods short and roundish or ovate.

Bracts persistent; ovules 2; cotyledons of the seedling broad and united by their bases; annuals.

Upper lip of calyx herbaceous and entire; flowers pale yellow; stems simple below, widely branching above. 15. *L. luteolus*.

Upper lip of calyx more or less scarious, emarginate or cleft.

Flowers commonly white or yellow; stem simple below, branching at the middle. 16. *L. densiflorus*.

Flowers light purple or flesh-color; stem commonly simple. 17. *L. microcarpus*.

1. *L. arboreus* Sims. Distinctly arborescent and 4 to 8 ft. high or lower and merely suffrutescent; lightly pubescent on the young stems and lower surface of the leaves; leaflets oblanceolate, 1 to 2½ in. long, 9 to 11 on the first leaves, 6 to 8 on the (later) leaves from the

axils, these smaller; raceme with very indistinct verticils, often 1 ft. long; pedicels 5 lines long; bracts linear, 7 lines long; upper lip of calyx slightly notched, the lower entire; corolla sulphur-yellow, 8 lines long; banner orbicular, mucronulate at apex, the sides reflexed; wings lightly coherent by their apices, inflated; keel falcate, purple-tipped, lightly ciliate; pod 2 to 3 in. long, 8 to 12-seeded; seeds oblong, dark.

Common in sandy soils near the ocean: Alameda; Angel Island; San Francisco and north and south along the coast. Apr.

2. **L. variicolor** Steud. Low, 1 to 1½ ft. high, the stems woody only at the very base; herbage scantily hairy-pubescent; leaflets 8 or the lowermost 6, oblanceolate, 7 to 9 lines long; raceme mostly 1½ to 3 in. long, the whorls 1 to 4; flowers 6 or 7 lines long; banner white or pale blue; wings blue; keel ciliate for its whole length.

Hillslopes near the seashore: San Francisco; Marin Co.

3. **L. Chamissonis** Esch. Stems densely tomentose, woody below, 1 to 3 ft. high; leaflets 6 to 9, more or less silky-pubescent, oblong-oblanceolate; petioles short, mostly not as long as the leaflets; flowers indistinctly or not at all whorled, bluish or lavender, the banner with a permanent yellow spot; keel glabrous.

Near the seashore; San Francisco and Marin Co. May. Very doubtfully distinct from no. 2, which is only provisionally maintained.

4. **L. albifrons** Benth. Branching bush 2 to 3 ft. high, with a distinct woody trunk; growth of the season silky-pubescent; leaflets 7 to 10, oblanceolate to obovate, 10 lines long or less, silvery-silky on both sides; petioles mostly longer than the leaflets; flowers deep blue, in mostly distinct whorls in a loose raceme often 1 ft. long; pedicels 3 lines long; upper calyx-lip broad, cleft, the lower entire; petals subequal; banner broad, with a whitish or sometimes yellow spot early changing to red-purple; keel ciliate; pod 2 in. long, 5 to 9-seeded; seeds oval, 2 lines long, brownish, with a marginal dark line.

Abundant, especially on the higher hills, in both the Coast Ranges and Sierra Nevada. Feb.-May. Sometimes low and caespitose, without a trunk.

L. EMINENS Greene grows on "burns" on Mt. Tamalpais; the seedlings, germinating in the rich ashy soil, grow rapidly and crowd each other up to a height of 6 ft. or less; the slender trunk, 1 in. in diameter, being scarcely branched save at the top. We do not consider it distinct from no. 4.

L. JUCUNDUS Greene. Shrub 1½ to 3 ft. high, all the younger stems silky-pubescent; leaflets 7 to 10, oblanceolate, obtuse, mostly 1 in. long; flowers blue, 6 or 7 lines long; raceme 5 in. long, the bracts slender, a little shorter than the flower-buds; upper calyx-lip deeply 2-cleft; lower lip entire or obscurely dentate; banner with a yellow spot in center; keel obscurely or plainly ciliate just below the apex.—Vacaville, Cal., *R. H. Platt*, Mar. 23, 1898. This species has, to us, no convincing characters.

5. *L. littoralis* Dougl. CHINOOK LIQUORICE. Stems slender, decumbent or ascending, 1 or 2 ft. long, from yellow and somewhat fleshy roots; leaflets 5 to 7, oblanceolate or cuneate-oblong, acute, $\frac{1}{2}$ to 1 in. long, at least half as long as the petioles, silky on both sides, the hairs short and appressed; flowers remotely whorled or more or less scattered in a short raceme; calyx-lips of nearly equal length, entire; banner red, shorter than the blue wings; keel ciliate; pod linear, hirsute; seeds linear, brown, with black spots.

Seashore from Point Reyes northward.

6. *L. sericatus* Kell. Stoutish, decumbent, 5 to 10 in. high, minutely but densely silky-canescens; leaflets 6 to 7, spatulate-obovate, obtuse or retuse, 1 to $1\frac{1}{4}$ in. long, on petioles $1\frac{1}{2}$ to 4 times as long; raceme 4 or 5 in. long, rather long-peduncled; flowers deep purple; calyx-lips large, the upper cleft, the lower obscurely 3-toothed; keel slender-pointed, lightly ciliate; seeds light brown and somewhat mottled.

Howell Mountain; Mt. St. Helena; Cobb Mountain. Apparently confined to the Mayacamas Range. May.

7. *L. latifolius* Agardh. Almost or quite glabrous, except a minute appressed pubescence on the stems and under surface of the leaves; stems dark green and shining, erect, with slender branches, 2 to 4 ft. high, equally leafy, the basal leaves not long-stalked; leaflets 5 to 7, broadly oblanceolate, thin, mucronulate, 1 to 3 in. long; racemes 6 to 17 in. long, slender-peduncled, loose, the verticils often distinct; pedicels slender; calyx-teeth elongated, the upper notched slightly at the narrow apex; corolla blue, changing to dull brown; keel ciliate below the middle.

Common plant in openly wooded cañons of the Coast Ranges: Ukiah; Vaca Mountains; Napa Mountains; Oakland Hills and southward. Apr.-June.

8. *L. formosus* Greene. Stems decumbent or ascending, 2 to 3 ft. long, the whole plant silky-pubescent; leaflets mostly 7 to 9, narrowly or broadly oblanceolate, abruptly acuminate, 1 to $1\frac{1}{2}$ in. long, equaling the petiole; raceme with more or less distinct whorls but often dense, the peduncle short or scarcely any; flowers 6 to 7 lines long, rich violet; keel glabrous.

Rich high places in the fields and sandy lands of the Coast Range Valleys and the plains of the Sacramento. Late summer and autumn.

9. *L. polyphyllus* Lindl. Stem stout, erect, nearly simple, 3 to 5 ft. high, sparingly villous, equally leafy up to the inflorescence; petioles 6 to 12 in. long except the uppermost; leaflets 9 to 16, oblanceolate or lanceolate, sparingly hirsute beneath, glabrous above, 3 to 6 in. long; stipules adnate for half their length; raceme short-peduncled, dense, 1 to 2 ft. long; flowers not in whorls or only subwhorled, on long pedicels; calyx-lips of nearly equal length, entire; bractlets often wanting; corolla 6 or 7 lines long, with blue wings and red-purple banner; keel falcate, acuminate, glabrous; pod 1 to $1\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, 7 to 9-seeded.

Near the coast from Marin Co. (Sausalito, Point Bonita, and Tennessee Bay) northward; also in the interior at higher altitudes (Howell Mountain, Mt. Shasta).

10. **L. affinis** Agardh. Stout and very succulent; stems fistulous, 14 to 20 in. high, branching mostly from the middle; glabrous except a short and sparse pubescence on the lower surface of the leaves; leaflets 6 or mostly 7 or 8, oblong-oblongate or broadly cuneate-obovate, obtuse or retuse, 1 to 2 in. long; petioles $1\frac{1}{2}$ to 4 in. long; racemes 4 to 8, on short peduncles; flowers 6 to 7 lines long; bractlets short; upper calyx-lip with 2 divergent teeth, the lower lip entire; petals 5 to 6 lines long, deep bluish-purple, the keel glabrous; ovary densely villous-pubescent.

Vacaville; Napa Valley; Martinez; Oakland Hills; San Francisco Peninsula and southward to Southern California. Very common in late Feb. and in Mar. Especially characteristic of depressions in hills caused by recent or old landslides. Also common along the banks of winter water-courses in the hills and in low heavy soil generally. The var. **CARNOSULUS** (*L. carnosulus* Greene) is usually simple with the keel villous in the middle.

11. **L. nanus** Dougl. Slender, not succulent, 6 to 15 in. high, often branching from the base, villous or finely pubescent; leaflets linear to oblanceolate, $\frac{1}{2}$ to 1 in. long, usually acute, the petioles 1 to 3 times longer; racemes loose, short-peduncled, 3 to 7 in. long, of several distinct or somewhat indistinct whorls of large fragrant flowers; bracts exceeding the calyx; pedicels slender, about 3 lines long; upper calyx-lip deeply cleft; lower calyx-lip 3-dentate, the middle tooth sometimes obscure or wanting; corolla 6 lines long; banner orbicular, retuse, with the sides reflexed, the white middle part purple-spotted and turning rose-red; wings lightly joined, forming an obliquely ovate inflated sac; keel falcate, ciliate above the middle.

Common everywhere in the Coast Range region and rather variable. Flowering mostly in Apr.

12. **L. micranthus** Dougl. Slender, simple or more frequently branched from the base, erect or ascending, 5 to 18 in. high, pilose-pubescent, not at all succulent; leaflets 5 to 7, linear to linear-spatulate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, the petioles twice as long; racemes peduncled, whorls 3 to 6, distinct or indistinct; pedicels $1\frac{1}{2}$ lines long, elongating more or less in fruit; upper calyx-lip with divergent triangular acute lobes, the lower long, entire; corolla 2 to $2\frac{1}{2}$ lines long, blue; banner with a white spot changing to light blue or purple; wings narrow, appressed; keel falcate, densely pilose-ciliate above the middle to near the apex; pod 5 to 7-seeded.

Exceedingly variable species, common everywhere in May in the hill country and on the plains; Coast Ranges; Sacramento and San Joaquin Valleys; Sierra Foothills. There are apparent transitions to the next species.

Var. **bicolor** (*L. bicolor* Lindl.). Lower calyx-lip twice as long

as the upper; corolla 3 to $4\frac{1}{2}$ lines long; folds on the center of the banner (covering the edges of the oblique portion of the wings) much more prominent.—Bay Region and northward.

Var. **pachylobus** (*L. pachylobus* Greene). Peduncles stout; flowers small, subsessile in few whorls; upper calyx-lip notched, the lower entire, twice as long; pods very large.—Briones Hills, Contra Costa Co. Apr.

13. **L. trifidus** Torr. Branched from the base, 7 to 12 in. high, densely pilose, the younger parts canescent; leaflets mostly 6 to 8, linear to linear-spatulate; racemes very short, mostly 2 to 3, sometimes 4; upper calyx-lip deeply cleft with divergent segments, the lower deeply 3-cleft into long slender segments; corolla 2 to $2\frac{1}{2}$ lines long, blue, the white spot on the banner not changing in age; keel scarcely falcate, short and obtusely pointed, sparsely ciliate from above the middle to just below the apex; pod 6 to 8-seeded; seeds quadrate-ovate, dotted or diagonally marked.

Sandy soil about the Bay and along the seaboard: Alameda and San Francisco, southward to Glen Echo (Santa Cruz Co.), *Setchell* and *Jepson*; Pacific Grove, *Tidestrom*. Doubtless no more than a good variety of the next; best known by its strikingly pilose pubescence and 3-cleft lower calyx-lip.

14. **L. polycarpus** Greene. Erect, somewhat succulent, with rather stout branches from the base or above the middle, moderately pubescent; leaflets 6 to 8, linear-oblongate, $\frac{1}{2}$ to 1 in. long, raceme narrow, rather short, with 4 to 7 distinct or indistinct whorls; pedicels 1 line long, ascending; upper calyx-lip 2-cleft, the lobes ovate, parallel; lower entire or obscurely dentate, somewhat longer; corolla $1\frac{1}{2}$ to 3 lines long, deep blue; banner obovate, retuse or truncate, the center white, with dark dots, changing to red-purple, the sides incurved, not reflexed; wings coherent at tip, inflated, exposing the base of the short and nearly straight keel; keel obscurely ciliate below the apex; pod rigid, slightly falcate, 1 in. long or more, 6 to 9-seeded.

Occurring in its typical form in rich soil of low fields about the Bay, and in a modified form on the plains of Solano Co. Characterized chiefly by its rather robust habit, short narrow close racemes of small flowers and many large pods. Apr.

15. **L. luteolus** Kell. Slender, simple below, loosely and widely branching above, 2 to $3\frac{1}{2}$ ft. high, rigid, not succulent; pubescence of short appressed silky hairs; leaves scattered; leaflets mostly 7, cuneate-oblong, 1 in. long, obtuse or acute; bracts linear-setaceous, often exceeding the calyx; flowers 6 lines long, pale yellow, nearly sessile, in a dense raceme $1\frac{1}{2}$ to 7 in. long; upper lip of calyx entire, not scarious; lower 3-toothed.

Stream and river beds: Contra Costa Co., *Mrs. J. T. Maynard*; near St. Helena, *Greene*, 1874; Lake Co., *Jepson*, 1892, and northward.

16. **L. densiflorus** Benth. Resembling the last but more sparingly villous; stem stout, somewhat succulent, simple below, parted

at the middle into many spreading branches; leaflets oblong-ob lanceolate, very acute, mucronate; racemes 6 to 10 in. long, on long peduncles; bracts setaceous, much shorter than the calyx; flowers white, yellow, or sometimes rose-color; calyx sparingly pubescent, the upper lip scarious, deeply cleft, the lower long, toothed.

Hillsides and banks of gullies; Marin Co.; Vaca and Napa Valleys; eastern San Joaquin Co. and southward to Southern California. Apr.-May. Flowers in this and the next 6 to 8 lines long.

17. *L. microcarpus* Sims. Simple or branched above, 1 to 1½ ft. high, somewhat succulent, villous throughout; leaves rather crowded; leaflets usually 9, cuneate-oblong, smooth above, varying at apex from acutish to emarginate, 1 to 2 in. long; bracts subulate-setaceous, equaling the calyx or shorter; flowers short-pedicel, purplish or flesh-pink; calyx densely hirsute, upper lip very short, subscarious, emarginate or cleft; lower obscurely 2 to 3-toothed; keel slightly ciliate; pod villous, 8 lines long.

Abundant on the plains of the Sacramento and San Joaquin; apparently also at Alameda. Apr.-May.

65. CUCURBITACEÆ. GOURD FAMILY.

Herbs, mostly tendril-bearing and succulent, with simple leaves. Flowers unisexual, the petals united and blended with the calyx. Calyx-tube in the pistillate flower adherent to the 1 to 6-celled ovary; stigmas 2 or 3; placenta parietal or projecting from the axis. Staminate flower with 3 stamens, 2 of these with 2-celled anthers, the third one with a 1-celled anther. Fruit gourd-like, or dry and dehiscent. Seeds large, anatropous, without endosperm.

An order of characteristic aspect, well known on account of the melon, pumpkin, cucumber and other esculent fruits of cultivation. The genus *Cucurbita* may be recognized by its prostrate scabrous vine-like stems, large yellow solitary flowers, distinct filaments and contorted confluent anthers. Two perennial species occur on the plains of the lower San Joaquin (Oakdale and southward). *C. FOETIDISSIMA* HBK., Calabazilla, has triangular-cordate or sub-cordate leaves, more or less denticulate, 4 to 6 in. long; calyx-tube ½ in. long. *C. PALMATA* Wats., Mock Orange, has palmately 5-cleft leaves and calyx-tube about 1 in. long.

1. *ECHINOCYSTIS* T. & G. BIG ROOT.

Trailing or climbing herbs with branched tendrils and thin leaves. Flowers small, greenish or white, monœcious, the staminate in axillary racemes or panicles, the pistillate pedicellate and solitary in the same axils. Calyx-teeth very small or obsolete. Corolla rotate or campanulate with 5 to 7 lobes or lanceolate segments. Staminate flowers with the short filaments united and the anthers distinct or coherent. Pistillate flowers with capillary staminodia or none; ovary globose or oblong, 2 to 4-celled, with 1 to 4 ovules in each cell; style very short; stigmas 2 to 3-parted or lobed. Fruit prickly, some-

what fleshy or pulpy, at length dry and bursting irregularly on the sides or near the apex. Seeds ovoid or broadly oblong, more or less compressed, surrounded by a marginal line. (Greek echinos, a hedgehog, and kustis, a bladder, in reference to the spiny fruit. Our species are all perennial from exceedingly large, often deep-seated, fusiform or globose roots, sometimes as large as and not unlike the shape of a man's body, whence the common name, "Old Man in the Ground." The germination of the seed is peculiar; see Gray, Structural Botany, p. 21.)

Corolla rotate, dull or greenish-white; pistillate flower without abortive stamens 1. *E. fabacea*.

Corolla campanulate, clear white.

Pistillate flowers with abortive stamens, the pedicels 3 to 6 lines long . . . 2. *E. Marah*.

Pistillate flowers without abortive stamens, the pedicels 1 to 2 in. long . . 3. *E. Watsonii*.

1. *E. fabacea* Naud. COMMON MAN ROOT. Usually nearly glabrous or with short scattered curved hairs; stems 12 to 30 ft. long; leaves rough-scabrous or smoother, more or less round-cordate in outline, 2 to 4 in. in diameter, with a deep and open sinus at base, mostly rather deeply 5 to 7-lobed, often with acutish segments; staminate flowers many in slender simple or compound racemes $3\frac{1}{2}$ to 5 in. long, the pedicels 1 to 3 lines long; corolla 3 to 4 lines in diameter, of a dull or greenish white; pistillate flowers 5 to 6 lines broad, destitute of abortive stamens, the pedicels 5 to 9 lines long; ovary globose, 2-celled, ovules 1 or 2 in each cell; fruit globose, 2 in. in diameter, very densely covered with stout spines 4 to 12 lines long; seeds commonly 4, sometimes less, oblong-ovoid, 9 to 13 lines long, 6 lines in diameter, surrounded by a shallow groove or darker lines.—(*Megarrhiza Californica* Torr.)

The most common species, growing upon open hills or climbing in thickets; in some localities still very abundant on rich sandy ridges (high places) of interior grain fields: Coast Ranges; Sacramento and San Joaquin Valleys. The var. *agrestis* Greene, of eastern Contra Costa Co., is described as having smaller fruits with few short spines. *E. MACROCARPA* Greene, Chilicothe, has a very spiny oblong pod 4 in. long.—Kaweah River basin to Southern California.

2. *E. Marah* Cogn. HILL MAN ROOT. Stems 4 to 25 ft. long, mostly smooth; leaves muriculate-scabrous, especially on the upper surface, or almost glabrous, reniform or round-cordate, 3 to 7 in. broad, 2 to 4 in. long, 5 to 7-lobed with round sinuses; staminate inflorescence 6 to 10 in. long, the corolla 6 to 7 lines broad, clear white; pistillate flower with abortive stamens (staminodia), on pedicels 3 to 6 lines long; ovary ovate, 2 to 3-celled; ovules 1 to 4 or more in each cell, attached to the outer side of the cell; fruit ovate-oblong, $2\frac{3}{4}$ to $3\frac{1}{2}$ in. long, somewhat attenuate at each end, particularly at apex, nearly smooth or muricate with short weak spines; seeds horizontally placed, nearly round, flattened, about 1 in. long, rather less than $\frac{1}{2}$ in. thick.—(*Megarrhiza Marah* Wats.)

Hills of Marin, Alameda and Contra Costa Cos., often climbing over shrubs and trees.

3. **E. Watsonii** Cogn. Nearly glabrous, glaucous; stems slender, not succulent, 4 to 8 ft. long; leaves orbicular-cordate with nearly closed sinus or broadly reniform, 2 to 4 in. broad, rather broader than long, deeply 5-lobed, the lobes broader above and sinuately toothed or lobed; staminate panicle slender, often few-flowered; the flowers small (about $1\frac{1}{2}$ to $2\frac{1}{2}$ lines in diameter), white; pistillate flowers 3 to 5 lines broad, without abortive stamens, on slender pedicels 1 to 2 in. long; ovary smooth or somewhat muricate; fruit nearly globose, 1 to $1\frac{1}{4}$ in. in diameter, somewhat naked toward the summit or covered all over with weak and very slender spines about $1\frac{1}{2}$ lines long, 2-celled, 2-seeded; seed not flattened, 7 to 9 lines long, 6 lines thick.

Vaca Mountains; otherwise unknown in the Bay Region. Sierra Nevada.

66. DATISCACEÆ. DATISCA FAMILY.

Perennial herbs with alternate and in ours divided leaves. Flowers diœcious or in ours the pistillate commonly with a few stamens. Calyx synsepalous. Corolla none. Stamens indefinite. Ovary inferior, 1-celled, with 3 parietal placentæ; styles 3, bifid. Fruit a capsule, opening at the top between the styles.

1. DATISCA L.

Stout glabrous herb. Leaves divided and more or less incised and sharply serrate. Flowers fascicled in the axils on short pedicels. Calyx of staminate flower very short (less than 1 line long), with 4 to 9 unequal lobes; stamens in ours 8 to 12, mostly 10; filaments short. Calyx of pistillate flowers with ovoid tube, somewhat 3-angled, 3-toothed, 3 to 4 lines long; stamens (when present) 2 to 4, alternate with the teeth. Seeds numerous, small, in 2 to several rows upon the placentæ.

1. **D. glomerata** (Presl.) Brew. & Wats. DURANGO ROOT. Stems commonly clustered, stoutish and somewhat fistulous, erect, branching above, $2\frac{1}{2}$ to 4 ft. high; lower leaves 5 or 6 in. long, nearly as broad, ternately divided and more or less incised and serrate, the middle division largest and 3-lobed, the lateral unequally 2-lobed or incised; upper leaves 2 to 3 in. long or more, with 3 lanceolate lobes, the lateral very much smaller and shorter; flowers in clusters in the axils of the leafy branches; staminate flowers in clusters of 3, on pedicels about 2 lines long; pistillate flowers sessile or subsessile, 4 to 7 in a cluster, or somewhat scattered along short axillary branchlets; anthers nearly 3 lines long, nearly sessile; styles longer than the ovary.

Dry stream beds: Coast Ranges (Vaca Mountains, Napa and Sonoma Cos. to Southern California); Sierra Nevada. June-July.

67. LOASACEÆ. LOASA FAMILY.

Herbs with either rough or stinging hairs, and often with white deciduous bark. Leaves in ours alternate. Flowers regular, perfect.

Calyx-tube adnate to the 1-celled ovary, its limb 5-lobed. Petals commonly 5. Stamens usually very numerous, inserted with the petals on the throat of the calyx. Placentæ 2 or 3, parietal. Fruit a capsule, crowned with the calyx-lobes.

1. MENTZELIA L.

Erect annuals. Leaves in age brittle, adhering very tightly to clothing by means of barbed hairs. Flowers terminal, solitary or cymose, small or showy. Styles 3, more or less united into one. Capsule dehiscent at the summit, few to many-seeded. Seeds flat; endosperm scanty. (Named for C. Mentzel, a German botanist of the 12th century.)

Annuals; capsule linear or clavate; petals 5,

Mostly 2 lines long or less.

Floral leaves broad, almost concealing the flowers; seeds much longer than broad 1. *M. micrantha*.

Floral leaves very much shorter than the flowers; seeds cubical. 2. *M. dispersa*.

Mostly 4 lines long or more.

Capsule linear, hispid; petals pale yellow, 3 or 4 lines long 3. *M. affinis*.

Capsule linear-clavate to obconic.

Petals about $\frac{1}{2}$ in. long 4. *M. gracilentia*.

Petals 1 to $1\frac{1}{4}$ in. long, golden-yellow 5. *M. Lindleyi*.

Biennial; capsule oblong; petals 10. 6. *M. lævicaulis*.

1. *M. micrantha* T. & G. Rough-hispid, at least above; stems simple below, corymbosely and rather compactly dichotomous above; leaves ovate, acute or acuminate, serrate or sinuate-toothed, 1 to 2 in. long or the uppermost roundish, entire, and 4 to 6 lines long; flowers shorter or scarcely exceeding the broad floral leaves; petals oval or obovate, $1\frac{1}{2}$ to 2 lines long, twice longer than the calyx-lobes; 5 of the filaments petal-like with emarginate apex; capsule linear, sharply triangular, 3 lines long; seeds 1 line long, twice as long as broad.

Coast Range hills from Saratoga, Santa Clara Co., *Davy*, Sept., 1893, to Mt. Diablo. Clear Lake, acc. to Bot. Cal.

2. *M. dispersa* Wats. Usually branching, 9 to 13 in. high; stems ostensibly smooth, pubescent under a lens; leaves oblong or ovate, $1\frac{1}{2}$ in. long or less, entire or sometimes toothed; flowers small, approximate near the ends of the branches; calyx-lobes 1 line long, little shorter than the obovate petals; filaments not dilated; capsule linear, 6 or 7 lines long; seeds cubical, minutely mottled, rather acutely angled, as broad as long.

Montane species: Lower Lake Grade to Kelseyville; Mt. Diablo. Also credited to the Sierra Nevada.

3. *M. affinis* Greene. Stoutish, simple and leafy below, widely branching above, 2 or 3 ft. high; leaves lanceolate in outline, deeply and often sharply pinnatifid; flowers 5 or 6 lines broad, numerous but not congested; calyx-lobes subulate, 2 lines long; capsule linear, subterete, $\frac{3}{4}$ to nearly 1 in. long, hispid with short stiff white hairs; seeds prismatic with grooved angles.

San Joaquin Valley plains; (?)Antioch. Insufficiently distinguished from the next.

4. **M. gracilentia** T. & G. Sparingly branched, or often simple, 1 to $1\frac{1}{2}$ ft. high; leaves narrowly oblong in outline, pinnatifid into broadly linear lobes or only coarsely sinuate-toothed; upper leaves sometimes disposed to be ovate or lanceolate, somewhat sharply cleft or entire; flowers clustered at the summit; calyx-lobes 2 to 5 lines long; petals obovate or oblanceolate, rounded or retuse at apex, 4 to 6 lines long, undoubtedly yellow but the exact shade unknown to us; filaments dilated and somewhat united at base; capsule clavate to obconic, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; seeds in 3 rows, angled, minutely tuberculate, $\frac{2}{3}$ line long.

Los Angeles northward to the Sacramento, acc. to Bot. Cal.; San Antonio River, *Brewer*.

5. **M. Lindleyi** T. & G. BARTONIA. Slender, simple or branching, $1\frac{1}{2}$ to 4 ft. high; leaves ovate to narrowly lanceolate, pectinately pinnatifid or coarsely toothed, 2 to 3 in. long; flowers axillary and terminal; calyx-lobes 5 to 9 lines long, broadly lanceolate, acuminate; petals obovate, abruptly acuminate, golden yellow with vermilion base, 1 to $1\frac{1}{4}$ in. long; stamens numerous, about three-fourths as long as the petals; filaments very slender; capsule linear-clavate, 1 to $1\frac{1}{4}$ in. long; seeds angular, minutely tuberculate.

Benicia, acc. to *Davy*; South Coast Ranges from Niles to Corral Hollow and southward to the region of Mt. Hamilton. May-June. Flowers opening in the evening and remaining open during the morning of the next day.

6. **M. lævicaulis** (Dougl.) T. & G. BLAZING STAR. Stout branching biennial, 2 to $3\frac{1}{2}$ ft. high, with shining white nearly smooth stems; leaves narrowly oblong or lanceolate, sinuately toothed, 3 to 7 in. long; flowers in clusters of 2 or 3 at the ends of the branches, 3 or 4 in. broad, light yellow; calyx segments lanceolate, 1 to $1\frac{1}{4}$ in. long; petals about 10, oblanceolate, the numerous stamens almost as long; capsule oblong, $1\frac{1}{4}$ in. long, 3 to 4 lines in diameter.

Stream beds throughout the Coast Ranges and Sierra Foothills. July-Sept. Flowers open all day.

68. LYTHRACEÆ. LOOSE-STRIFE FAMILY.

Herbs with opposite or alternate entire leaves. Flowers perfect, axillary or whorled. Calyx tubular, free from but enclosing the ovary, 4 to 7-toothed, sometimes with accessory teeth in the sinuses. Petals 4 to 6, inserted with the 4 to 12 stamens on the calyx. Capsule in ours 2 to 4-celled.

Flowers subsessile or pediceled, solitary in the axils; calyx cylindrical; leaves alternate.

Flowers sessile in the axils, 2 to 4 in a whorl; calyx in fruit globose; leaves opposite 1. LYTHRUM.
 2. AMMANNIA.

1. LYTHRUM L. LOOSE-STRIFE.

Slender herbs. Leaves sessile, in ours alternate. Flowers solitary in the axils, purple or whitish. Calyx cylindrical, 8 to 12-ribbed,

with 4 to 6 teeth and an equal number of accessory ones in the sinuses. Petals 5 or 6, the stamens as many or twice as many. Style filiform; stigma capitate. Capsule oblong or cylindrical, 2-celled. (Greek luthron, blood, applied either on account of the color of the flowers or the styptic properties of certain species.)

Flowers distinctly pediceled; corolla 2 or 3 lines long, bright purple; perennial. 1. *L. Californicum*.
 Flowers subsessile; corolla 1 line long or less, pale purple or almost white. Perennial, stoloniferous. 2. *L. adsurgens*.
 Annual, not stoloniferous. 3. *L. Hyssopifolia*.

1. *L. Californicum* T. & G. COMMON LOOSE-STRIPE. Perennial; stems erect, paniculately branching above, 2 or 3 or even 6 ft. high; leaves broadly or narrowly linear, less commonly lanceolate, mostly $\frac{3}{4}$ to 2 in. long; flowers distinctly pediceled; calyx $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, its teeth sharply acute; petals 2 to 3 lines long, bright purple.

Common in low valley and marshy lands and about springs in the mountains: Newark; Suisun, etc. June-Sept.

2. *L. adsurgens* Greene. Stoloniferous perennial; branches 5-angled, decumbent or assurgent, 1 to 3 ft. long; herbage pallid, slightly succulent; calyx $2\frac{1}{2}$ lines long, 12-ribbed, the ribs in maturity widening and thickened below; teeth minute, subulate; petals pale purple or almost white, minute.

Low wet places at West Berkeley; (?) central Solano Co. Scarcely more than a robust perennial variety of the next.

3. *L. Hyssopifolia* L. Annual; stems slender and simple or with several branches from below the middle, 4 to 9 in. high; herbage pale, glabrous; leaves linear or oblong, 3 to 7 lines long; flowers subsessile in the axils; calyx 2 lines long; petals 1 line long or less, pale purple or whitish.

Dry hillsides or hollows of the Coast Range Mountains, preferring slightly alkaline localities: Knight's Valley Grade and Howell Mountain southward to New Almaden. Aug.-Sept.

2. AMMANNIA L.

Glabrous annuals with mostly 4-angled stems. Leaves opposite, sessile or narrowed to a short-petioled base. Flowers purplish, 2 or more in each axil. Calyx campanulate (in fruit globose or nearly so), the tube 8-ribbed, 4-toothed and usually with small accessory teeth in the sinuses. Petals 4, purplish, small and deciduous, or wanting. Stamens 4 to 8. Capsule globular. (Named for Johann Ammann, a German botanist of the 18th century.)

Leaves sessile by a broad auricled base. 1. *A. coccinea*.
 Leaves tapering at base, sometimes short-petioled. 2. *A. humilis*.

1. *A. coccinea* Rottb. Erect, simple or branching below, 4 to 14 in. high; leaves horizontally spreading, broadly linear or somewhat narrowed towards the apex, 1 to 2 in. long, sessile by a broad auricled base; flowers in whorls of 2 to 5; calyx in flower narrowly campanu-

late, strongly 8-ribbed, in fruit distended and the ribs less obvious; capsule 2 lines long.

Low lands along interior rivers; Cache Creek, *Bolander*; Lower Sacramento Islands; San Joaquin River.

2. *A. humilis* Michx. Smaller; leaves linear-oblongate, tapering at base (not auricled) and sometimes short-petioled; flowers 1 to 3 in each axil; accessory teeth of the calyx sometimes as long as the proper teeth; capsule dehiscent septicidally.

Stockton.

69. ONAGRACEÆ. EVENING-PRIMROSE FAMILY.

Annual or perennial herbs with simple leaves sometimes lobed or divided. Flowers complete, symmetrical, 4-merous (rarely 5 or 2-merous), in spikes or racemes, or solitary. Calyx-tube adnate to the ovary, the petals inserted at its summit, and the stamens twice as many or as many. Pollen commonly cobwebby. Style always single; lobes of the stigma as many as the cells of the ovary, or stigma capitate. Capsule commonly 4, sometimes 5 or 2-celled. Seeds mostly small, naked or with a tuft of hairs at apex (coma); endosperm none.

An order of showy plants with a large representation in western America. Gayophytum with six species in California, approaches *Oenothera*; it has very small white or pink flowers and a 2-celled ovary. The species are all very slender annuals and all beyond our limits, mostly in the High Sierras. *Heterogaura Californica* Rothrock, which is allied to *Clarkia*, occurs in the Sierra Nevada from Yuba Co. to Fort Tejon; it has 4 of the 8 stamens sterile and an indehiscent fruit with one seed in each cell.

Parts of the flower in 4's or 5's; fruit a capsule (indehiscent in no. 1).

Tube of the calyx not produced beyond the ovary, the limb divided down to the ovary and persistent on it after flowering.

Petals 5, 6 lines long or more; fruit at length reflexed . . . 1. JUSSIEA.

Petals none or minute; fruit erect . . . 2. LUDWIGIA.

Tube of the calyx produced beyond the ovary, the limb with the free portion of the calyx-tube deciduous after flowering; parts of the flower always in 4's; ovary 4-celled.

Seeds with a tuft of hairs at one end.

Flowers large; corolla and calyx scarlet. 3. ZAUSCHNERIA.

Flowers small; corolla white or purplish. 4. EPILOBIUM.

Seeds naked.

Flowers purple, rose-color or white, never yellow.

Calyx-lobes erect or ascending; petals small or minute. 5. BOISDUVALIA.

Calyx-lobes reflexed or the tips remaining united and turned to one side in anthesis.

Petals distinctly clawed, often much lobed, the stamens opposite them frequently wanting 6. CLARKIA.

Petals sessile, not lobed except in *G. biloba*; stamens always 8. 7. GODETIA.

Flowers yellow or (in two species) white 8. OENOTHERA.

Parts of the flower in 2's; fruit bur-like 9. CIRCÆA.

1. JUSSIEA L.

Glabrous perennial herbs, ours riparian or of muddy shores. Leaves

alternate. Flowers yellow, solitary in the axils, pediceled. Calyx-tube elongated, not produced beyond the ovary, its lobes 5. Petals 5. Stamens twice as many. Fruit (in ours) 5-celled. Seeds very numerous. (Bernard de Jussieu, who founded the natural system of classification.)

1. **J. Californica.** CALIFORNIA WATER-WEED. Stems $1\frac{1}{2}$ to 6 ft. long; leaves of floating plants orbicular to elliptic, nearly 1 to $1\frac{1}{2}$ in. long, on petioles almost as long; leaves of erect plants of muddy shores broadly oblong, acute at base and apex, or obovate, 1 to 2 in. long, the petioles $\frac{1}{2}$ in. long; calyx-lobes lanceolate, $\frac{1}{2}$ in. long; petals broadly obovate, 6 to 7 lines long; fruit woody, cylindric, 10 lines long, indehiscent, at length reflexed and the calyx-segments deciduous from the mature fruit; fruiting pedicel $\frac{1}{2}$ to $\frac{3}{4}$ in. long; seeds large for the order, with a very thick tough outer coat; cotyledons elliptic, caulicle very short.

Region of the Lower Sacramento and the Lower San Joaquin, particularly in tide sloughs; Cache Creek, *Bolander*; Clear Lake, *Jepson*; Warm Springs, Alameda Co.; lakelet near Aptos, Santa Cruz Co., *Setchell*; Pajaro, Monterey Co., *Chandler*; Visalia; Bakersfield. July-Sept.

2. **LUDWIGIA** L. FALSE LOOSE-STRIFE.

Aquatic or marsh perennial herbs, with the aspect of the preceding, but the leaves opposite, parts of the flower in 4's, and the petals often absent. Stamens as many as the petals and alternate with them. Ovary broad at apex and usually flattened, or crowned with a conical style-base. Capsule 4-celled, dehiscent by lateral slits or terminal pores. Seeds minute. (C. G. Ludwig, 1709-1773, Professor of Botany at Leipsic.)

1. **L. palustris** Ell. WATER PURSLANE. . Glabrous, stem 6 to 12 in. long; leaves obovate, acute or acuminate, narrowed at base into a rather long petiole, the whole leaf 8 to 12 lines long; petals none, or minute and reddish; capsule erect, broadly oblong, $1\frac{1}{2}$ lines long, more or less 4-sided or -angled, with a narrow longitudinal band of tubercles on each side.

Muddy shores: Healdsburg, *Miss King*; Clear Lake, *Jepson*. Aug. Fr. Sept. Capsule yellowish, the persistent sepals green.

3. **ZAUSCHNERIA** Presl.

Low perennials, with alternate leaves (the lowest opposite) and large scarlet Fuchsia-like flowers. Calyx above the ovary colored like the corolla, its tube funnellform with a globose base (nectar-bearing within), and appendaged within at the most constricted portion with several erect and deflexed scales. Petals scarlet, inserted on the throat of the calyx and rather shorter than its erect lobes, obcordate or 2-cleft. Stamens 8, exserted, colored like the corolla; anthers linear-oblong, attached by the middle. Style long and exserted, stigma 4-lobed. Capsule linear, obtusely 4-angled, 4-valved and imperfectly 4-celled. Seeds oblong, with a tuft of hairs at the

apex. (In memory of M. Zauschner, a Bohemian botanist, one time Professor of Natural History in the University of Prag.)

1. **Z. Californica** Presl. BALSAMEA. Stems decumbent or erect, about 1 ft. high, woody at base, the herbage more or less villous or woolly; leaves oblong to linear-lanceolate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, the lowest opposite; flowers $1\frac{1}{2}$ to 2 in. long; calyx-lobes 4 lines long.

Dry stream-beds of the Coast Ranges, particularly on benches, but also along cliffs in the crevices of rocks. Aug.-Oct. Used as a vulnerary in rural medicine by Spanish-Californians. First collected at Monterey in 1792 by Thaddeus Hænke of the Malaspina Expedition, the first botanist to visit California. An exceedingly variable species. The var. *latifolia* Hook (*Z. latifolia* Greene) is often nearly glabrous and has broadly ovate to ovate-lanceolate leaves, conspicuously feather-veined.—Mt. Diablo range and middle altitudes of the Sierra Nevada.

4. **EPILOBIUM** L. WILLOW HERB.

Erect herbs; annual, perennial by creeping root-stocks, or propagating in the autumn by offsets. Leaves opposite or alternate. Flowers purple, rose-color or white. Petals 4, often emarginate or bifid. Stamens 8, the 4 alternate shorter. Stigma oblong or 4-lobed. Ovary long and narrow, 4-celled. Capsule 4-valved. Seeds numerous, the summit bearing a tuft of long hairs (coma). (Greek *epi*, upon, *lobus*, a pod, and *ion*, a violet.)

Flowers small; petals notched or obcordate, not opening beyond funnel-form (except no. 7?); capsule rather prominently ribbed or angled.

Perennials; coma mostly persistent.

Leaves mostly alternate; petals $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.

Glabrous below; inflorescence white-pubescent . . . 1. *E. Californicum*.

Pubescence chiefly glandular: var. *occidentale* of . . . 2. *E. adenocaulon*.

Silky pubescent throughout . . . 3. *E. holosericeum*.

Leaves mainly opposite; petals 3 to 5 lines long.

Tomentose; flowers exceeding the reduced upper leaves . . . 4. *E. Watsoni*.

Glabrate below, glandular-pubescent above; flowers scarcely surpassing the terminal leaves . . . 5. *E. Franciscanum*.

Annuals; stems with shreddy bark at base; coma very deciduous.

More or less pubescent, $\frac{1}{2}$ to 1 ft. high; petals emarginate . . . 6. *E. minutum*.

Glabrous or glandular, $1\frac{1}{2}$ to 5 ft. high; petals deeply 2-cleft . . . 7. *E. paniculatum*.

Flowers large; petals entire, opening nearly flat, 5 to 7 lines long; capsule terete; perennials . . . 8. *E. spicatum*.

1. **E. Californicum** Hausskn. Glabrous below, the inflorescence and buds rather coarsely white-pubescent, slender, 3 to 4 ft. high; leaves lanceolate or oblong-lanceolate, remotely serrulate, 3 to 4 in. long or less, short-petioled; flowers few; peduncles of mature fruit slender, occasionally equaling the floral leaves; capsules nearly glabrous.

First collected near Fort Ross by Wrangell; common in low ground on the Lower Sacramento.

2. **E. adenocaulon** Hausskn. var. *occidentale* Trelease. Finely glandular-pubescent, especially on the strict branches, 3 to 4 ft. high,

remotely leafy; leaves triangular-lanceolate, 2 in. long or less, denticulate, short-petioled, passing into the small floral ones, these acute at both ends; flowers small; petals 1 to $1\frac{1}{2}$ lines long; capsule slender, short-pedicelcd.

About springs in the mountains and moist places in the valleys: North Coast Ranges; Napa Valley; Lake Co.; Suisun Marshes.

3. **E. holosericeum** Trelease. Silky-pubescent or canescent, simple below, loosely branched above, 3 to 4 ft. high; leaves oblong-lanceolate, low-serrulate, narrowed into short petioles, 2 to 4 in. long, those of the flowering branches small and scattered; flowers scattered along the elongated branches, petals 2 lines long, nearly white; peduncles of mature capsules 5 lines long.

Stream beds: Vaca Valley and Weldon Cañon; first described from specimens collected in San Bernardino Co. Aug.-Sept.

4. **E. Watsoni** Barbey. Tomentose-pubescent throughout, $1\frac{1}{2}$ ft. high; leaves elliptical, denticulate, rounded to short-winged petioles; flowers rose-red, not so crowded as in the preceding, protruding beyond the more reduced and lanceolate upper leaves; seeds coarsely papillate, coma dingy.

First collected at Fort Ross; not known otherwise, at least within our limits.

5. **E. Franciscanum** Barbey. Glabrate below, glandular-pilose above, 1 to 3 ft. high; leaves elliptic- to ovate-lanceolate, serrate, on short petioles, the lower opposite, the uppermost often pilose along the midrib; racemes dense, the red-purple or pale flowers scarcely surpassing the somewhat reduced bracts; capsule 2 in. long; seeds hyaline, papillate, coma sometimes tawny.

Muddy margins of lakes and streamlets: San Francisco. No. 2 approaches this, but differs in its smaller and less corymbosely-clustered flowers.

6. **E. minutum** Lindl. Pubescent below, 5 to 12 in. high, commonly with diffuse ascending branches; leaves broadly or narrowly lanceolate, entire or denticulate, 6 to 9 lines long, veinless; flowers distributed along the stem, rose-color or white; petals emarginate, 1 line long; 4 longer stamens equaling the style; capsule 1 in. long, pedicelcd; seeds $\frac{1}{2}$ line long or less.

Dry hills of the Coast Ranges: Mt. Tamalpais; St. Helena and northward. May. Dwarf forms, 2 to 3 in. high, occur on the Mayacamas Range. The var. *foliosum* T. & G. has linear-spatulate leaves, with smaller ones fascicled in the axils.—Napa Valley, *Bigelow*; Geysers, *Greene*. The var. *Biolettii* Greene is minutely canescent on the inflorescence and has much smaller flowers than the species.—Mill Valley.

7. **E. paniculatum** Nutt. Glabrous below, more or less glandular above; stem very shreddy, simple below, paniculately branched above, $1\frac{1}{2}$ to 5 ft. high or more; leaves lanceolate, mostly alternate, with smaller ones fascicled in the axils, sharply but minutely denticulate, mostly veined, $1\frac{1}{4}$ to 2 in. long; flowers few, terminating the

almost filiform spreading and nearly leafless branches, the bracts almost subulate; petals deeply 2-cleft into linear-oblong lobes, rotate-spreading, rose-purple, 3 to 4 lines long; capsule pediceled, about 1 in. long, sharply 4-angled and acuminate beaked; seeds $\frac{1}{2}$ to 1 line long.

Dry ground, everywhere common. July-Oct. Main stem often very stout and thick below, and rapidly diminishing upwards.

8. *E. spicatum* L. FIRE-WEED. Stems erect, mostly simple from a stout root, 2 to 5 ft. high, glabrate below, the inflorescence canescent; leaves alternate, lanceolate, nearly entire, 4 to 6 in. long, the lateral veins confluent in submarginal loops; flowers large, in long racemes with small slender bracts; calyx cleft almost to the ovary; corolla slightly irregular, lilac-purple; petals 5 to 7 lines long, entire; stamens purple, in a single row, with filaments dilated at base; style exceeding the stamens, hairy at base, at first recurved; capsule 2 to 3 in. long.

Common in the Sierra Nevada and North Coast Ranges, appearing in great abundance on forest-burned areas; collected within our limits only in Sonoma Co. near Guerneville, *Davy*. July. Entire inflorescence often purple, especially in the bud.

E. OBCORDATUM Gray, alpine in the High Sierras, is a span high with bright rose-colored obcordately 2-lobed petals and yellow stamens.

5. *BOISDUVALIA* Spach.

Erect annuals with alternate leaves. Flowers small or minute, in leafy spikes or axillary along the branches. Calyx-tube (above the ovary) short, obconic, the lobes erect. Petals 4, obovate, sessile, 2-lobed, purple to white. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule 4-celled, 4-valved, sessile. (Jean-Alphonse Bois-duval, French naturalist and physician, author of *Flora Francaise*, published at Paris in 1828.)

- Petals white, cleft into 2 unequal lobes 1. *B. bipartita*.
 Petals rose-color, purple or violet, cleft into 2 equal lobes; capsule membranous.
 Capsule terete, septifragal, the septa wholly persistent on the placenta, which is thus 4-winged 2. *B. densiflora*.
 Capsule terete, loculicidal, the septa adherent to the valves in dehiscence. Floral leaves ovate or oblong 3. *B. campestris*.
 Floral leaves linear 4. *B. stricta*.
 Capsule 4-sided, coriaceous; dehiscence unknown 5. *B. cleistogama*.

1. *B. bipartita* Greene. Nearly 1 ft. high, simple or with decumbent branches from the base, the herbage pale and villous; leaves linear-lanceolate to lanceolate or those of the inflorescence ovate-lanceolate, entire or obscurely denticulate; petals white, very deeply parted into 2 unequal lobes, the smaller about $\frac{2}{3}$ the length of the other, the open corolla thus seemingly composed of 8 petals, 4 long and 4 short; capsule villous; seeds few and large.

Arroyo del Valle, Alameda Co., *Greene*, June 14, 1895.

2. *B. densiflora* (Lindl.) Wats. Erect, commonly 1½ ft. high, branched above, leaves lanceolate, 2 in. long, the floral ovate,

acute, about 3 to 6 lines long; inflorescence spicate, commonly elongated; petals about 2 lines long, about twice as long as the lobes of the calyx, and exceeding the subtending leaves; capsule 2 lines long, dehiscent; seeds ovate or triangular-ovate.

Of wide distribution in the Sacramento, San Joaquin and Coast Range valleys and among the hills, preferring low ground where water has stood in spring pools: Stockton; Santa Clara Co.; Monterey; Berkeley; Napa Valley, etc. Also in the Sierra Nevada. June-Sept. Passes into the following: Var. *IMBRICATA* Greene. Bracts densely imbricated, concealing the capsules; spikes commonly very long and virgate.—Santa Cruz; Marin Co.; Vaca Valley, etc. Var. *MONTANUS*. Short lateral spikelets numerous below the short terminal spike, each spikelet subtended by a narrowly lanceolate bract $1\frac{1}{2}$ to 2 in. long.—Howell Mountain, Napa Co.

3. *B. campestris*. Commonly branched from the base and 5 to 9 in. high, with a short scattered pubescence or nearly glabrous, the foliage bright green; upper (flowering) portion of branches densely imbricated with ovate or oblong denticulate leaves 5 or 6 lines long, in fruiting stage concealing the capsules; lower leaves ovate-lanceolate, scattered and rather longer, often with flowers in their axils; petals 2 lines long, purple; stamens opposite the sepals $1\frac{1}{2}$ lines long, the alternate ones shorter (sometimes with nearly sessile anthers); capsule almost straight, pointed at apex, 3 lines long; seeds fusiform, about 60.

Little Oak, Lower Sacramento Valley, to the plains of the San Joaquin between Oakdale and La Grange; associated with *B. cleistogama*. Last of May-June. The lower (foliage) leaves turn brown early, and by the time the plant is in fruit have disappeared; the bracts remain green for a much longer period. The technical characters of separation from *B. glabella* Walpers, of Oregon, are not as strong as could be desired; that plant is taller and with decidedly looser spikes. Our plant doubtless bears much the same relation to *B. glabella* that *B. densiflora* var. *imbricata* holds to *B. densiflora*.

4. *B. stricta* Trelease. Simple or often diffusely branched from the base, 5 to 13 in. high, pilose-pubescent or somewhat canescent; leaves linear, $1\frac{1}{2}$ in. long or less; petals 1 line long, violet; capsule slender, attenuate, arcuate-recurved, 6 to 7 lines long, not promptly dehiscent.

Lower Sacramento Valley; Angwin's meadows, Howell Mountain, and Cloverdale, southward to New Almaden and the Santa Lucia Mountains. June. Frequently flowering from the very base, the branches often with sparse foliage, or the foliage strict.

5. *B. cleistogama* Curran. Commonly with stout rigid whitish branches or rarely simple, 4 to 8 in. high, pilose-pubescent, somewhat glandular, glaucescent; leaves linear or lanceolate, 1 to $1\frac{1}{2}$ in. long, remotely denticulate; flowers axillary along the branches, the earliest fertilized in the bud and never expanding, the later light pink; petals 2 lines long, bifid; capsule 4-sided, the septal lines on each side distinct, sharply pointed, 5 lines long, hard coriaceous, very tardily dehiscent, if ever.

Elmira (where first collected by Mrs. K. Brandegee); Antioch; between Oakdale and La Grange, *Jepson*. The shallow vernal pools of the Sacramento and San Joaquin Valleys are quickly dried up in the first month of summer. After the water has disappeared these dry beds support a peculiar flora, one species being the plant here described which deserves much further study. The square capsules with the sharp angles and distinct septal lines recall the fruits of certain species of *Godetia*; they also resemble those of *Gaura* in certain particulars.

6. *CLARKIA* Pursh.

Erect annuals with brittle stems and alternate leaves. Flowers showy, in terminal racemes (nodding in the bud). Calyx-tube above the ovary obconical or much prolonged and almost filiform, its lobes reflexed in flower or remaining united and turned to one side. Petals 4, purple or rose-color, with claws, the limb entire or lobed. Stamens typically 8, those opposite the petals often sterile and rudimentary, or wanting. Ovary 4-celled; style elongated, the stigma with 4 broad lobes. Capsule linear, or attenuate above, straight or somewhat curved, coriaceous, somewhat 4-angled, 4-valved. Seeds numerous, angled or margined. The lower leaves in this and in the two succeeding genera often disappear very early. (In honor of Captain Clarke of the Lewis & Clarke party, first expedition across the Rocky Mountains to the Pacific, 1806.)

Petals entire; calyx-tube short, obconical, $1\frac{1}{2}$ lines long; stamens 8.—

Subgenus *EUCLARKIA*.

Claw broad and short, much shorter than limb of petal, often toothed . .

1. *C. rhomboidea*.

2. *C. elegans*.

Petals lobed; calyx-tube almost filiform above the ovary, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; stamens 4, those opposite the petals wanting.—Subgenus *EUCHARIDIUM*.

Petals 3-lobed, the lobes nearly equal 3. *C. concinna*.

Petals fan-shaped and obcordate, a linear or spatulate lobe proceeding from the deep sinus and exceeding in length the lateral lobes, which are several times larger 4. *C. Breweri*.

1. *C. rhomboidea* Dougl. Erect, 1 to 3 ft. high, more or less branching, finely puberulent; leaves oblong to ovate, the blades entire, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, on petioles $\frac{1}{2}$ in. long, more or less; calyx-tube above ovary obconic, $1\frac{1}{2}$ lines long; calyx-lobes narrowly linear, carinate; petals rose-purple, often purple-dotted toward the base, rhomboidal, 3 to 5 lines long, the limb with a short broad often toothed claw; filaments with whitish hairy scales at base, those alternating with the petals with longer scales; capsule sessile or very shortly pedicel, commonly somewhat curved, 1 in. long.

Sierra Nevada and Coast Ranges, from the foothills to middle altitudes: Mt. Hamilton; Mt. Diablo; Lake Co., etc. Last of May–July.

2. *C. elegans* Dougl. Habit similar to the preceding; herbage often reddish; leaves narrowly ovate, sometimes repand-denticulate, short-petioled; calyx-lobes broadly linear, plane; petals entire, about 8 lines long, the limb about equaling the narrow entire claw; each

filament with a reddish densely hairy scale at base, most developed opposite the short stamens; anthers of long stamens bright crimson, 3 lines long; anthers of short stamens commonly white; capsule usually curved, sessile, 7 to 12 lines long, often hairy.

Same range as no. 1 and as common: Santa Clara Co.; Oakland Hills; Napa; Vacaville; Upper Sacramento, etc. Flowering contemporaneously. Petals often spreading laterally in pairs, the 4 longer stamens with deflexed or retrocurved filaments.

C. XANTIANA Gray, of the Upper San Joaquin at Fort Tejon, is like this species in calyx character but may be known by its 2-lobed petals with a subulate lobe in the sinus.

3. *C. concinna* (F. & M.) Greene. Simple below or diffusely much branched from the base, $\frac{1}{2}$ to 2 ft. high, nearly glabrous; leaves broadly to narrowly oblong; calyx-tube above ovary 8 lines long; calyx-lobes crimson, linear-lanceolate, 9 lines long, abruptly recurved from the middle; petals rose-purple, 7 to 12 lines long, cuneate-obovate, 3-lobed, the middle broadest but little larger than the lateral; filaments not at all or scarcely dilated at base or apex, the anthers recurved after dehiscence and sparsely short-ciliate; capsule sessile, nearly straight, $\frac{3}{4}$ to 1 in. long; seeds short subcylindric, pointed at one end, the other end oblique and margined with a dense row of short teeth.—(*Eucharidium concinnum* F. & M. *C. grandiflora* Greene.)

Common in the Coast Ranges at middle altitudes, rarely in the lower foothills: Humboldt Co. acc. to Blankinship; Round Valley, *Westermann*; Ukiah; Napa Mountains; Vaca Mountains; Petaluma; Ross Valley; Oakland Hills; Mt. Hamilton and Loma Prieta. Yosemite Valley, acc. to Mrs. Brandegee. Last of May–June. The three upper petals are commonly approximate and ascending, the lower one opposite these and declined, thus making a corolla which is physiologically irregular and bilabiate.

4. *C. Breweri* (Gray) Greene. Five to 9 in. high; calyx-tube above ovary 1 to $1\frac{1}{2}$ in. long; petals rose-color, fan-shaped and obcordate, about 1 in. long, the rather deep sinus with a linear or spatulate lobe proceeding from it which surpasses the large lateral lobes; filaments spatulate, dilated at apex; anthers linear, 3 lines long, pilose-ciliate; style much longer than the stamens; capsule stout, sessile, straight, $1\frac{1}{2}$ in. long; seeds as in the preceding.—(*Eucharidium Breweri* Gray.)

Rare and somewhat local species of the Mt. Diablo Range: first discovered on the summit of Mt. Oso by Brewer, no. 1247, June 9, 1862; Loma Prieta, *Price*; Mt. Hamilton; Hernandez; Priest Valley. The filaments and style are colored like the petals. The flowers diffuse a most delicate fragrance, recalling the honeysuckle of old-time gardens.

7. *GODETIA* Spach.

Simple or branching erect annuals with alternate leaves. Flowers mostly in leafy racemes or spikes. Calyx-tube above the ovary

obconic or short-funnelform. Petals 4, broad and sessile, entire, emarginate or in one species 2-lobed, varying from phlox- or lilac-purple or rose-color to nearly white. Stamens 8, those opposite the petals shorter; anthers basifixed. Ovary 4-celled. Capsule ovate to linear, mostly 4-sided, somewhat coriaceous, often longitudinally ribbed, 4-celled, 4-valved. Seeds in 1 or 2 rows, more or less cubical or quadrangular, usually obliquely pointed at one end, the opposite end obliquely truncate and with a densely fimbriate-toothed or tuberculate margin; angles often prismatic, rendering the seed strikingly similar to that of *Mentzelia*. (C. H. Godet, 1797-1879, author of "Flore de Jura.")

Flowers in a lax spike or raceme; buds often nodding; capsules linear.

Petals deeply 2-lobed 1. *G. biloba*.

Petals not lobed.

Capsules all or at least some pedicellate, not costate, but the callous lines of dehiscence or septal lines often prominent.

Petals $\frac{1}{2}$ in. long or less 2. *G. epilobioides*.

Petals $\frac{3}{4}$ in. long or more 3. *G. amœna*.

Capsules sessile, bicostate on 4 or 2 sides (smoothish in var. *tenella*) . . . 4. *G. quadrivulnera*.

Flowers in a mostly dense spike; buds never nodding; capsule ovate to oblong, bicostate on the sides.

Spike with short branchlets 5. *G. albescentis*.

Spike simple 6. *G. lepida*.

1. ***G. biloba* Wats.** One and one-fourth to 2 ft. high, usually branching above; sparsely puberulent; leaves linear, 1 to $1\frac{3}{4}$ in. long, petioled; calyx-tips remaining united and turned to one side in the bud; petals purple, deeply 2-lobed, the lobes somewhat divergent, $\frac{1}{2}$ in. long; style shorter or twice as long as the stamens; stigma lobes $\frac{1}{2}$ line long, elliptic; capsule sessile or nearly so, smoothish.

Briones Hills; Martinez; Antioch; Mt. Diablo; common in the Sierra Foothills. May.

2. ***G. epilobioides* Wats.** Tomentosely puberulent, $\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; leaves linear (or inclined to lanceolate), denticulate; calyx red; "petals light purple" (drying white), 3 to 6 lines long; capsule acuminate at apex, attenuate to a short pedicel, rarely subsessile.

Antioch, acc. to Brandegee in Herb. Cal. Acad.; Sierra Foothills, acc. to Watson; Arroyo Grande, Monterey Co.; Southern California.

3. ***G. amœna* Lilja.** HERALD OF SUMMER. One and one-fourth to $2\frac{1}{2}$ ft. high, of branching habit, sparsely puberulent or nearly glabrous; leaves oblong or widest below the middle, entire or remotely denticulate, rather slender-petioled, $2\frac{1}{2}$ in. long or less; sepals remaining united and turned to one side, partly separating or separating in pairs; petals nearly white to rose-color or phlox-purple, with splotch in center or crimson base, cuneate-obovate, obtuse or truncate at apex, abruptly short-clawed, $\frac{3}{4}$ to 1 in. long; anthers purple, 3 to 5 lines long, the upper end empty and bright yellow; stigmas linear, whitish or purplish, 1 to 2 lines long; capsule mostly long-pedicel or at first nearly sessile, 1 to $1\frac{1}{2}$ in. long, terete, attenuate to each end, not ribbed but the lines of dehiscence and the septal lines unusually prominent.

Hillsides and ridges of the outer Coast Ranges: Santa Cruz; San Francisco Peninsula; Oakland Hills; Belvedere; Mt. Tamalpais; Olema; Petaluma; Healdsburg, etc. June and July. Mostly branched above, occasionally at base, often simple, especially when low. Buds oblong, acute, puberulent. Anthers in anthesis coiling into a ring. Less vigorous specimens, 2 to 3 in. high, are frequent.

Var. *concolor*. Simple, 1 ft. high, nearly glabrous, leaves linear, 1 in. long; sepals pinkish, turned to one side in the flower; petals 5 to 6 lines long, crimson; anthers somewhat spirally twisting after dehiscence; stigmas oblong or elliptical, $\frac{1}{2}$ line long; capsule unknown. —Pope Valley grade from Calistoga, May 2, 1893; Walker Cañon, Vaca Mountains, May 17, 1892, *Jepson*. A puzzling form, referred here provisionally as a variety.

4. *G. quadrivulnera* Spach. Simple or with erect branches from the base, finely pubescent or the younger parts (especially the ovary) canescent; leaves linear or narrowly oblong, entire or slightly denticulate, mostly less than 1 in. long, sessile or very short-petioled; petals 4 to 6 lines long, truncate or obtuse or even subacute, towards apex erose-denticulate; style longer or shorter than stamens; capsule pilose-pubescent, 2-ribbed on the four sides, sessile.

Very common in the Coast Ranges and Sierra Foothills. May-June. A variable species, especially in pubescence, size, foliage, color of flowers and character of capsules. The leaves subtending capsules are often elongated, thickish and conduplicate, especially on plants of the inner Coast Ranges; such plants commonly have very lax spikes. Plants observed in 1896 at Forest Grove, Santa Cruz Mountains, growing within a space of twenty square ft. and indubitably of common parentage showed the following variations in color of petals: (1) Pale lilac or almost white. (2) Similar in color but with purplish or deeper colored base. (3) Similar to no. 1 but with small wedge-shaped purple or crimson spot at apex. (4) Like preceding, but with the spot larger. (5) Uniformly deep purple or crimson. In these same plants the style was either shorter, as long as, or 3 or 4 times longer than the stamens. Capsule in this species also variable as to ribbing; plants with only the anterior and posterior faces plainly 2-costate are referred to this aggregate. The var. *TENELLA* (*G. tenella* as to Wats.) has nearly smooth capsules. The seeds of the species are somewhat cubical, rather obtusely pointed at one end, with the opposite end square and fimbriate-edged or margined. More extensive comparisons may reveal several species here taken as one, but the present results of field studies do not encourage this supposition.

5. *G. albescens* Lindl. Stem simple or branching from the base, 1 to 2 ft. high; more or less canescent; leaves oblong to lanceolate, sparingly denticulate, 1 in. long; flowers mostly crowded on many short lateral spikelets; petals purplish blue, 3 to 5 lines long; capsule oblong, conspicuously 8-ribbed, 3 to 6 lines long, pubescent.

An indefinite and little known species: Oakdale (San Joaquin Valley). Seemingly passes into the

Var. *micropetala* (*G. micropetala* Greene). Leafy inflorescence

much more elongated and lax; lateral spikelets short, or but a single flower in the axils.—Martinez; grade to Napa Soda Springs; Middle-town grade, Mt. St. Helena.

6. *G. lepida* Lindl. Stems simple, 1 ft. high or less; herbage puberulent; leaves oblong, $\frac{3}{4}$ in. long; buds pilose, elliptic-oblong; petals crimson, broadly truncate-obovate, 9 lines long; stigma-lobes purple, oval, $\frac{1}{2}$ to $\frac{3}{4}$ line long.

Sacramento and San Joaquin Valleys. May. The var. ARNOTTI Wats. has thicker and broader glabrous leaves, with one side of the isodiametrical seeds narrowly margined or slightly ciliate.

8. *ÆNOTHERA* L.

Herbs with alternate leaves. Flowers yellow or white, often turning greenish or reddish. Calyx-tube prolonged beyond the ovary, mostly deciduous, the lobes 4, reflexed. Petals 4. Stamens 8, equal, or those opposite the petals shorter, mostly versatile, sometimes basifixed. Capsule membranous to woody, often contorted or spirally coiled, 4-celled, 4-valved, dehiscent, in ours sessile. Seeds many, in 1 or 2 rows in each cell, naked. (Greek oinos, wine, and therea, pursuit, name given by Dioscorides to some now unknown plant, the roots of which were eaten to incite desire for wine.)

Caulrescent; calyx-tube much prolonged beyond the ovary, and linear.

Flowers yellow; tall biennial; var. *grandiflora* of . . 1. *Æ. biennis*.

Flowers white; low plants.

Perennial; calyx-tips free in the bud 3. *Æ. Californica*.

Biennial, calyx-tips not free in the bud. 2. *Æ. trichocalyx*.

Acaulescent; calyx-tube much prolonged beyond the ovary, and filiform; flowers yellow.

Perennial; leaves ovate or oblong, acute; petals 6 lines long or more . .

4. *Æ. ovata*.

Annual; leaves linear; petals 3 to 4 lines long. . . 5. *Æ. graciliflora*.

Caulrescent; calyx-tube obconic, little prolonged beyond the ovary; flowers yellow.

Capsule sharply quadrangular, much contorted or spirally coiled; flowers turning greenish; radical leaves in a rosette or tuft.

Maritime species; procumbent or prostrate.

Petals 3 to 5 lines long 6. *Æ. cheiranthifolia*.

Petals 1 to 2 lines long. 7. *Æ. micrantha*.

Interior species; erect or suberect; petals 1 line long

8. *Æ. hirtella*.

Capsule not contorted or only slightly, linear, terete, $\frac{1}{2}$ line wide or less; radical leaves none.

Petals 1 to 2 lines long; anthers innate. 9. *Æ. strigulosa*.

Petals 2 to 3 lines long; anthers versatile. 10. *Æ. dentata*.

1. *Æ. biennis* L. var. *grandiflora* Lindl. Biennial, erect, usually simple, 2 to 4 ft. high; herbage canescently puberulent and often hirsute; leaves ovate to lanceolate, 4 in. long or more; calyx-tube 1 to 2 $\frac{1}{2}$ in. long, the tips free in the bud; petals yellow, 1 to 1 $\frac{1}{2}$ in. long and quite as broad; anthers versatile, $\frac{1}{2}$ in. long; style disk-shaped below the cylindric stigmas; capsule obtusely quadrangular, woody, $\frac{1}{2}$ to 2 in. long, the valves with a strong midrib; seed sharply angled, in 2 rows in each cell.

Sparingly naturalized: Alvarado; Lake Merced; St. Helena; Calistoga. May.

2. *Æ. trichocalyx* Nutt. Biennial; stems from a straight tap-root, low, very stout, upright, simple or more commonly branched from the base, 1 ft. high, puberulent or sparsely pilose and almost glabrous; leaves oblong, tapering to both ends, petioled, coarsely and rather remotely salient-toothed or lobed, 3 to 4 in. long, or the lowest longer; calyx-tips not free in the bud; bud (above calyx-tube) oblong, densely woolly, nearly 1 in. long or more; petals 1 in. long or more, usually with a deep sinus; capsule terete, strongly thickened towards the broad sessile base, $2\frac{3}{4}$ in. long or less, in maturity strongly deflexed, slightly curved, woody; seeds narrowly ovate, mottled, somewhat compressed, in 1 row in each cell.

Corral Hollow, "summits of very dry sandy hills; petals obcordate, white, turning rose when old, light yellow in center," *Brewer*, June 3, 1862; southward to Bakersfield and the desert region. Depauperate plants are almost or quite acaulescent, but may be distinguished from the truly acaulescent species by the large flowers as well as by the fruit. This is properly a desert plant of the Mohave region, eastward and northeastward.

3. *Æ. Californica* Wats. Similar to the preceding; hoary pubescent; stems from a perennial running rootstock, slender, ascending; calyx-tips free in the bud; bud (above calyx-tube) narrowly ovate, villous; capsule not thickened at base; seeds oblong, turgid.

Sacramento, *Shockley*, 1883; Antioch sandhills and the San Joaquin Valley. Stem not so stout at base as in the preceding; flowers vespertine, remaining open two or three hours in the morning or on a cloudy day until noon, fading purplish.

4. *Æ. ovata* Nutt. GOLDEN EGGS. SUN CUPS. Acaulescent; root fleshy, $\frac{1}{2}$ to 1 in. thick and 3 or more in. long; glabrous or the leaf margins and veins beneath ciliate; leaves oblong to ovate, acute, 3 to 6 in. long, mostly entire, spreading upon the ground rosette-like or somewhat ascending, the under ones narrowed at base to rather longer petioles; calyx-tube very slender, 3 in. long, the segments glabrous; petals orbicular, $\frac{1}{2}$ in. long; capsules more or less below the surface of the ground, chartaceous, 1 in. long, tardily dehiscent; seeds in this and the next in 2 rows in each cell.

Common in the Coast Range valleys from Ukiah and Calistoga to Marin Co., San Francisco, Millbrae and southward to San Luis Obispo. Feb.-Apr. Called "Blood-root" about Berkeley seventeen years ago (T. S. Palmer).

5. *Æ. graciliflora* H. & A. Acaulescent; pilose-pubescent; leaves erect or ascending, linear, obscurely denticulate or commonly entire, $3\frac{1}{2}$ in. long or less; calyx-tube beyond ovary filiform, about 1 in. long, the segments hirsute-pubescent; petals broadly obovate, the broad shallow notch at apex with a middle tooth or acumination, 3 to 4 lines long; capsule coriaceous.

Hillsides: Contra Costa to Santa Clara Cos.; foothills of the Yallo Bally Mountains; Marysville Buttes; Sierra Nevada. Apr. Petals often turning greenish or reddish.

6. *Æ. cheiranthifolia* Hornem. Stems decumbent or mostly

prostrate and radiating from a central rosette crowning the taproot, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, rigid and tough; leaves thick, canescently pubescent, obovate to oblong or oblong-oblancoelate, obtuse, short-petioled or the uppermost sessile, $\frac{1}{2}$ to 1 in. long; calyx-tube 1 to 2 lines long; the petals 3 to 5 lines long, broader than long and more or less truncate at apex; capsule acutely quadrangular or almost fluted, stout, chartaceous, linear-oblong, $\frac{3}{4}$ in. long, spirally once coiled, the attenuate apex mostly spreading; seeds in 1 row in each cell as in all the following.

Drifting sandhills: Oakland, San Francisco and southward along the coast. Flowering in summer, and more or less at all seasons.

7. *Æ. micrantha* Hornem. Branches procumbent from a short primary axis, not rigid or tough; pubescence hirsutulous; leaves oblong-lanceolate, $1\frac{1}{2}$ in. long, slightly undulate, more or less denticulate; petals entire or emarginate, 1 to 2 lines long; capsule sharply 4-angled, 1 in. long, contorted, often coiled into a single spiral, slightly attenuate upwards, sparsely hirsutulous, less chartaceous than in the last.

Along the coast from San Francisco southward. May-June.

8. *Æ. hirtella* Greene. Simple or with simple branches from the base, the branches suberect, flowering from the base or near it, 9 to 13 in. high, hispidly hirsute; leaves round or oblong-ovate, subcordate, crenately toothed, crisped, 6 to 9 lines long, the radical oblong or oblong-spatulate, narrowed to a petiole, $1\frac{1}{4}$ in. long; petals 1 line long; capsule quadrangular, 8 lines long, contorted, not spirally coiled or rarely, submembranaceous as in the next two species.

Dry mountain ridges: Lower Lake; Vaca Mountains; Mt. Diablo; Pajaro Hills. May. This and the two species preceding have radical leaves in a tuft or rosette, in this species disappearing rather early. The next two species are without a radical rosette or tuft.

9. *Æ. strigulosa* T. & G. Wholly glabrous or minutely pubescent with short scattered hairs, the ovaries gray-pubescent; stems and branches slender, 6 to 10 in. high, at first erect, at length diffusely branched; leaves linear, remotely low-denticulate, most of them $\frac{1}{2}$ in. long; petals 1 to 2 lines long, yellow, aging to bright red; anthers innate; capsule linear, straight, $\frac{3}{4}$ to $1\frac{3}{4}$ in. long, $\frac{1}{4}$ line wide.

Common throughout California, especially in sandy soil: Mendocino Co.; Yuba Co.; Calistoga; Alameda; San Francisco; Southern California. May-June. Often only 2 to 4 in. high and strict, or with decumbent branches 1 ft. long.

10. *Æ. dentata* Cav. Branched from the base, bushy, 9 in. high; sparsely pubescent with short stiffish spreading hairs; leaves linear, mostly tapering to both ends, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, denticulate, often with smaller leaves fascicled in the axils; petals yellow changing to dull red, round-obovate, 2 to 3 lines long; anthers versatile; capsule similar to no. 9, 1 in. long, arcuate-recurved.

Antioch and common southward on the sandy San Joaquin plains. Middle of Apr.-June. This is the *Æ. campestris* of Greene, who regards the California plant as distinct from the Chilean plant, the

latter being the type of *Æ. dentata*. The var. *CRUCIATA* Wats. has narrowly obovate or oblong petals one-half as large.

9. *CIRCÆA* L. ENCHANTER'S NIGHTSHADE.

Low slender perennials with thin opposite petioled leaves. Flowers small, white, in terminal and lateral racemes. Calyx-tube slightly produced beyond the ovary, the base nearly filled by a cup-shaped disk, deciduous; lobes 2, reflexed. Petals 2, obcordate. Stamens 2, alternate with the petals. Ovary 1 or 2-celled, each cell 1-ovuled. Fruit indehiscent, pear-shaped and bristly with hooked hairs. (*Circe*, sea-nymph, daughter of the Sun and of *Perse*.)

1. *C. Pacifica* Asch. & Mag. Stem from a short rootstock, usually simple, 6 to 14 in. high; glabrous; leaves orbicular to mostly ovate, obtuse to cordate at base, acuminate, obscurely repand-denticulate or almost entire, 1 to 2 in. long on petioles $\frac{3}{4}$ to 1 in. long; racemes bractless; flowers $\frac{1}{2}$ line long; calyx white, with a very short tube; fruit rather less than 1 line long, the bristle-like hairs curved at tip, 1-celled, 1-seeded.

Deep shades of woods. Collected in the Bay Region only at Lagunitas Creek, Marin Co., *J. P. Moore*, July 4, 1878; ranging northward through Mendocino and Humboldt to Mt. Shasta, *Jepson*, thence southward in the Sierra Nevada to Placer Co., *Cosumnes*, *Hansen*, Yosemite Valley, and Marble Fork of the Kaweah. Rather rarely collected in California.

70. HALORAGÆ. WATER-MILFOIL FAMILY.

Perennial aquatic herbs, the leaves (in ours) in whorls. Flowers sessile in the axils of leaves or bracts, perfect or unisexual. Calyx-tube coherent with the ovary, the limb very short or obsolete. Petals small, 2 to 4, or none. Stamens 1, 4, or 8. Ovary 1 to 4-celled; stigmas 1 to 4. Fruit a 1-seeded indehiscent nutlet, or 4-lobed and splitting into 4 nutlets.

Leaves all entire; flowers perfect; stamen 1; ovary 1-celled

1. *HIPPURIS*.

Immersed leaves capillary dissected; flowers polygamous; stamens 4 or 8; ovary 4-celled

2. *MYRIOPHYLLUM*.

1. *HIPPURIS* L. MARE'S TAIL.

Stems erect, unbranched. Leaves simple, entire. Flowers minute, usually perfect, sessile in the axils. Petals none. Calyx limb a narrow entire rim. Stamen 1, inserted on the anterior edge of the calyx. Style 1, filiform, stigmatic down one side. Ovary 1-celled, becoming a 1-seeded nutlet. (Greek *hippos*, a horse, and *oura*, a tail.)

1. *H. vulgaris* L. Herbage glabrous; stem simple 1 to 2 ft. long (commonly emersed 4 to 7 in.); leaves about 7 to 10 in a whorl, linear, acute, $\frac{1}{2}$ in. long; fruit nearly 1 line long.

Shallow margins of ponds and about springs: Marin Co.; Sierra Nevada.

2. MYRIOPHYLLUM L.

Leaves alternate, or (in ours) whorled, the emerged ones entire or pectinate, those under water pinnately divided into capillary divisions. Flowers sessile in the axils of the upper leaves or forming a terminal interrupted spike. Upper flowers generally staminate, the lowest pistillate, and the intermediate often perfect. Calyx of the pistillate flowers 4-toothed or the teeth none, of the staminate 4-lobed. Petals 2 to 4, or none. Stamens 4 or 8. Stigmas 4, recurved and plumose. Fruit splitting at maturity into 4 bony 1-seeded nutlets. (Greek *murios*, a thousand, and *phyllon*, a leaf.)

Flowers in a terminal interrupted spike. 1. *M. spicatum*.
Flowers in the axils of the emerged linear leaves. 2. *M. hippurioides*.

1. *M. spicatum* L. WATER-MILFOIL. Stems branching, 1 to 2 ft. long; leaves in whorls of 3 or 4, dissected into capillary divisions; floral leaves or bracts ovate, entire or serrate and usually shorter than the flowers, which thus form an interrupted spike 1 to 4 in. long; petals 4; stamens 8; fruit 1 line long, and fully as thick; carpels rounded on the back with a deep groove between them.

Lakes and ponds: San Francisco Peninsula; Camp Taylor, *Behr*. July-Aug.

2. *M. hippurioides* Nutt. Leaves in whorls of 4; emerged ones linear, serrate or the uppermost nearly entire, 3 to 5 lines long; submerged ones dissected into capillary divisions, 1 to 1½ in. long; flowers chiefly in the axils of the emerged leaves; petals white, obovate; stamens 4; carpels less rounded.

Clear Lake, *A. B. Simonds*; Stockton, *Sanford*.

71. ARALIACEÆ. ARALIA FAMILY.

Commonly shrubs or trees, but ours herbs. Very closely allied to Umbelliferae, but the stems solid, the petals not inflexed and the styles and carpels (in ours) more than two. Flowers 5-merous except the pistil. Calyx-tube coherent with the ovary; its limb obsolete. Ovary 2 to 5-celled. Fruit berry-like, containing as many 1-seeded nuts as there are carpels. The cultivated Ivy, *Hedera helix*, belongs to this family and climbs by its adventitious roots.

1. ARALIA L.

Perennial herbs with alternate compound leaves. Ovary 2 to 5-celled. Embryo minute. (Derivation uncertain.)

1. *A. Californica* Wats. GINSENG. Rootstock with milky juice, 3 in. in diameter or less, giving off below numerous tap-like roots ½ to 1½ ft. long, bearing above the deep circular scars of successive generations of stems, and terminating at one end in the stem of the season; plant 6 to 10 ft. high; herbage glabrous or subulate-scabrous on the main stem; leaves ternate, then pinnately 3 to 5-foliate, 1 to 5 ft. long; leaflets elliptic or round-ovate, serrate, acuminate, subcordate at base, ½ to 1 ft. long; flowers on pedicels ½ in. long. 50 to 60 in an

umbel; umbels borne in a panicle 1 to 1½ ft. long; flowers whitish, 1½ lines long; calyx a mere rim, with 5 salient teeth; ovary red, becoming in fruit a globular black berry 2½ lines in diameter; styles united to the middle.

Shaded cañons and beds of mountain streams: Coast Ranges (except the inner Coast Range) and Sierras. July. Fr. Oct. Leaflets often oblique, petiolulate, the pair below the terminal leaflet short-petiolulate or sessile; umbels with involucre of several linear bractlets.

72. UMBELLIFERÆ. PARSLEY FAMILY.

Herbs with commonly hollow stems and often dilated petioles. Leaves alternate or radical (opposite in *Bowlesia* and in some *Eryngium* species), compound or often simple, usually much incised or divided. Flowers in simple or commonly compound umbels. Umbels, when compound, with the peduncle divided at summit into a number of rays, each ray bearing a secondary umbel termed an umbellet. Umbellets commonly subtended by bractlets (forming an involucre); rays commonly subtended by bracts (forming an involucre). Calyx-tube wholly adnate to the ovary; calyx-teeth small, sometimes obsolete. Petals 5, usually with an inflexed tip. Stamens 5, inserted on an epigynous disk. Ovary inferior, 2-celled. Styles 2, united below and forming a swollen or cushion-like base (stylopodium). Fruit consisting of two carpels united by their flat faces (commis- sure), flattened laterally (*i. e.*, flattened sidewise or contrary to the commis- sure), or flattened dorsally (*i. e.*, each carpel flattened on the back or parallel with the commissure), or not flattened at all. Each carpel with 5 ribs or ridges, one down the back (dorsal rib), 2 on the edge near the commissure (lateral ribs), and 2 between the dorsal and lateral ribs (intermediate ribs). Between the ribs are the spaces called intervals:—the dorsal intervals are those next to the dorsal rib; the lateral intervals are those next to the lateral ribs. Beneath the intervals (in the tissue of the pericarp), as well as on the commissural side, are oil-tubes. Carpels 1-seeded, splitting apart at maturity, each borne on a filiform division of the receptacle (or carpophore) which is prolonged between them. Embryo small; endosperm cartilaginous. The inflorescence is frequently irregularly compound; in a few genera the fruit has no ribs, and in others no oil-tubes. The number of oil-tubes in a given species is, generally speaking, a reliable character but it should be noted that there is here, also, more or less variation. The character of the ribs and oil-tubes should be ascertained by examination of perfectly mature fruit.

A. Fruit covered with prickles, tubercles, or scales, or the ribs bristly.

Fruit bearing an elongated beak several times longer than the body; oil-tubes none; annuals. 5. SCANDIX.

Fruit not produced into a beak.

Oil-tubes obscure; perennials. .

Fruit covered with hyaline scales; flowers greenish white or bluish, in dense peduncled heads; prickly herbs. 3. ERYNGIUM.

Fruit bur-like, covered with hooked prickles; flowers yellow, or purple in one species, mostly in head-like clusters. 4. SANICULA.

- Fruit elongated, its ribs upwardly bristly; flowers white in compound umbels. 6. OSMORRHIZA.
- Oil-tubes conspicuous; flowers white; annuals or biennials.
- Ribs armed with barbed or hooked bristles.
- Fruit somewhat flattened dorsally; calyx-teeth obsolete; umbels compound. 7. DAUCUS.
- Fruit flattened laterally; calyx-teeth obvious; umbels simple or nearly simple. 8. CAUCALIS.
- Ribs inconspicuous; fruit papillate-roughened; umbels irregularly compound; di- or tri-chotomous branching annual. 9. APIASTRUM.
- B. Fruit not prickly, nor tuberculate, nor scaly (sometimes hairy).**
- Leaves opposite; fruit ovate, turgid; ribs none; slender annuals. 1. BOWLESIA.
- Leaves alternate or in a radical tuft; perennials or biennials.
- Leaves simple; stems creeping; umbels simple or proliferous.
- Leaves orbicular or peltate; oil-tubes none. 2. HYDROCOTYLE.
- Leaves consisting of hollow cylindrical petioles; oil-tubes solitary. 18. CRANTZIA.
- Leaves pinnately or ternately compound, or decompound; umbels compound.
- Fruit not flattened dorsally, sometimes somewhat laterally flattened; ribs not winged.
- Flowers white.
- Oil-tubes none.
- Fruit linear or elongated, $\frac{1}{2}$ to 1 in. long. 6. OSMORRHIZA.
- Fruit ovate, $1\frac{1}{2}$ lines long. 10. CONTIUM.
- Oil-tubes solitary in the intervals.
- Umbels subsessile in the forks and terminal on the branches; fruit less than 1 line long. 12. APIUM.
- Umbels terminal on the branches.
- Leaves pinnate or bipinnate.
- Leaflets serrate; plants of marshes or stream banks.
- Ribs corky, but distinct.
- Styles short. 13. CICUTA.
- Styles elongated. 19. CENANTHE.
- Ribs confluent, forming a continuous corky covering. 20. BERULA.
- Leaflets entire; ribs filiform; plants of dry ground. 15. CARUM.
- Leaves triternately dissected; fruit less than 1 line long. 14. AMMI.
- Oil-tubes 2 or more, at least in some of the intervals.
- Leaves simply pinnate; bracts and bractlets present. 17. SIUM.
- Leaves 2 or 3 times ternate; bracts and bractlets mostly none. 16. PIMPINELLA.
- Flowers yellow.
- Rather low plants; leaves mostly radical; leaflets broad. 11. VELEA.
- Tall leafy plants; leaves dissected into filiform segments. 21. FENICULUM.
- Fruit flattened dorsally; the lateral ribs winged.
- Oil-tubes as long as the fruit.
- Dorsal and intermediate ribs winged or very prominent; flowers white; tall and leafy plants.
- Leaves ternate, then pinnate; oil-tubes 1 to 3 in the intervals. 23. ANGELICA.
- Leaves pinnate; oil-tubes solitary in the intervals. 22. SELINUM.
- Dorsal and intermediate ribs filiform.
- Acaulescent or short caulescent.
- Wings corky-thickened; flowers commonly yellow; tall plants with large leaves. 24. LEPTOTENIA.
- Wings thin; flowers yellow, white or purple; low plants. 25. PEUCEDANUM.

Stems tall, angular and channeled, branching and leafy; flowers yellow 26. *PASTINACA*.
 Oil-tubes reaching only half way to the base of the fruit; marginal flowers of umbel with radiately enlarged corollas; tall coarse plants 27. *HERACLEUM*.

1. *BOWLESIA* R. & P.

Delicate annuals with stellate pubescence, opposite leaves and scarious lacerate stipules. Umbels simple, few-flowered, on short axillary peduncles. Flowers white, minute. Calyx-teeth prominent. Fruit ovate, somewhat flattened laterally, with narrow commissure, turgid, becoming depressed on the back. Ribs and oil-tubes none. (William Bowles, 1705-1780, Irish naturalist and traveler.)

1. *B. lobata* R. & P. Branching, the stems diffuse or procumbent, $\frac{1}{2}$ to 2 ft. long; leaves thin, reniform-cordate, mostly 5-lobed and some of the lobes 1 or 2-toothed; petioles 1 to 3 in. long or less; umbels 1 to 4-flowered; fruit 1 line long.

Shade of rocks or shady banks in the Coast Ranges from Petaluma, San Francisco, Oakland Hills, San Leandro Creek, Santa Lucia Mountains and southward to Southern California. Also in the Sierra Nevada (San Andreas, Mokelumne Hill). Apr.

2. *HYDROCOTYLE* L.

Perennial herbs without erect stems, the peduncles and leaves from creeping stems or rootstocks. Leaves simple, round in outline, long-petioled. Flowers in a small umbel, or disposed in 2 or more umbels which are proliferous one above the other. Fruit flattened laterally, suborbicular, acutely margined and with 1 or 2 ribs on each side. Oil-tubes none. (Greek *hudor*, water, and *cotule*, a low vessel, the peltate leaves of some species being saucer-shaped.)

Leaves not peltate, 5 or 6-cleft; umbels simple 1. *H. ranunculoides*.
 Leaves peltate, slightly crenate; umbels proliferous 2. *H. prolifera*.

1. *H. ranunculoides* L. f. *WATER PENNYWORT*. Glabrous; stems floating or creeping in mud, rooting at the nodes; leaves orbicular, 5 or 6-cleft, the lobes crenate, $1\frac{1}{2}$ in. broad or less; petioles 3 to 5 in. long; peduncles 1 to 2 in. long, reflexed in fruit; pedicels $\frac{1}{2}$ line long; fruit ovoid, 1 line broad or broader; ribs obscure.

Pools or muddy shores often floating in rather deep water: San Francisco to San Jose. May.

2. *H. prolifera* Kell. *MARSH PENNYWORT*. Descending branches of the rootstock tuberous-enlarged; umbels proliferous, one above the other in 3 or 4 whorls (each whorl 5 to 15-flowered); leaves orbicular-peltate, emarginate at base, slightly crenate, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. broad, petioles 10 to 13 in. long; peduncles nearly as long; pedicels 1 to 3 lines long; mature fruit 1 line long and slightly broader, slightly notched at apex.

Suisun Marshes and southward to Southern California.

3. *ERYNGIUM* L. *BUTTON SNAKEROOT*.

Perennials with clustered fibrous roots, often dichotomously branch-

ing stems, prickly involucre and often prickly leaves. Leaves opposite, or the upper sometimes alternate, simple, commonly oblanceolate and spinulose-serrate or incised, or the radical, when growing in water, with fistulous petioles and the blade more or less obsolete. Flowers greenish white or bluish, condensed in heads, terminal on the branches or on short peduncles in the forks; bracts spinose, conspicuous; bractlets usually spinose-tipped. Calyx-lobes persistent on the fruit. Fruit covered with whitish thin scales; ribs obsolete. Oil-tubes none. (Greek name used by Dioscorides.)

Heads greenish.

Calyx-lobes in fruit longer than the styles.

Bracts and bractlets entire, callous-margined 1. *E. armatum*.

Bracts and bractlets spinulose, at least toward the base 2. *E. Vaseyi*.

Calyx-lobes in fruit shorter than the styles 3. *E. Californicum*.

Heads very blue 4. *E. articulatum*.

1. **E. armatum** C. & R. POINT REYES ERYNGO. Diffusely branching, the stems 3 to 5 or 10 in. long; leaves broadly oblanceolate, incised or merely serrate, the teeth spinose; bracts and bractlets very prominent, broadly lanceolate, strongly spinose-tipped, with an entire callous margin, sometimes scarious-winged at the very base, 7 lines long or less; calyx-lobes longer than the styles, narrowed at apex into a sharp point or cusp.

Lowlands near the coast from Monterey to Berkeley; Marin Co.; and Petaluma. Very abundant on Point Reyes. the tough spiny plants covering hundreds of acres and therefore in disfavor with the dairymen.

2. **E. Vaseyi** C. & R. VASEY'S ERYNGO. Stout, erect, more or less branching, commonly 8 to 13 in. (or sometimes 2 ft.) high; lower and radical leaves narrowly oblanceolate, spinulose, somewhat incised or bearing small lanceolate lobes below, 4 to 8 in. long, or the upper cauline much shorter; bracts spinose, spinulose toward the base, 6 to 10 lines long, much surpassing the bractlets; bractlets surpassing the flowers, similar; fruit with abruptly cuspidate calyx-lobes longer than the short styles.

Very common in low places on the plains of the Sacramento Valley. Doubtless also in the San Joaquin. May-June.

3. **E. Californicum**. Plants growing in shallow vernal pools, the earliest leaves fistulous, jointed at intervals ($\frac{1}{2}$ to 2 in.), sometimes with a short dilated tip, 19 in. long or less; fistulous leaves mainly disappearing with the gradual drying up of the pools and flowering branches arising; stems slender, freely branching, $1\frac{1}{4}$ to $1\frac{3}{4}$ ft. high; lowest and upper cauline leaves oblanceolate, spinulose, sometimes incised, narrowed at base to a slender spinulose petiole; heads $1\frac{1}{2}$ to 3 or 4 lines broad, surpassed by the bracts; bracts about 5 to 10 lines long, with few short bristles at base; bractlets with a broad scarious margin at base, not spinulose; calyx-lobes oblong or lanceolate, cuspidate, much shorter than the long styles.—(*E. petiolatum* of American authors, doubtless not of Hook.)

Rather common in the Coast Ranges: Alameda Co.; Napa Valley, etc. Fistulous leaves appearing in Apr. Fruit ripe July-Sept.

4. *E. articulatum* Hook. Erect, sparingly branched above, 2 to 3 ft. high; lower leaves fistulose, elongated, jointed; upper leaves sometimes opposite; heads ovoid, 4 to 7 lines high; bracts narrowly linear, elongated, more or less spinulose-serrate; bractlets blue, lanceolate, entire, more or less scarious-margined; calyx-lobes bluish, lanceolate, equaled by the styles.

First collected in the Couer d'Alene region, Idaho, by Geyer; common in the Suisun Marshes (whence the type specimens of *E. Harknessii* Curran, which, acc. to Britten, Journ. Bot. July, 1900, is a synonym); should be looked for in the Alvarado Marshes. Aug.-Sept.

4. *SANICULA* L. SNAKE ROOT.

Glabrous perennials with almost naked or few-leaved stems and irregularly compound few-rayed umbels. Involucres usually of leafy and toothed bracts. Involucels of small and entire bractlets. Flowers greenish yellow, or purple in no. 5, unisexual, or perfect and staminate, both sorts in the same head-like cluster or umbellet, the staminate flowers often pediceled. Calyx-teeth slightly foliaceous, persistent. Fruit subglobose or obovoid, without ribs, densely uncinat-prickly, the prickles tuberculate or pustulate at base. Oil-tubes large, commonly 3 dorsal and 2 commissural, or many and irregularly distributed. (Diminutive form, derived from Latin *sanere*, to heal, certain species used in medicine.)

Mature fruit pediceled; leaves palmately lobed or divided.

Bractlets about 5 lines long, much exceeding the umbellets; stems decumbent. 1. *S. arctopoides*.

Bractlets 1 line long or less, shorter than the umbellets; stems erect. 2. *S. Menziesii*.

Mature fruit sessile.

Salt marsh species; leaves not divided. 3. *S. maritima*.

Hill country species.

Leaves palmately parted or divided. 4. *S. laciniata*.

Leaves pinnately divided and subdivided.

Stems from a rootstock; leaf divisions decurrent on the toothed rachis. 5. *S. bipinnatifida*.

Stems from an elongated tuber; leaf-divisions mostly of distinct leaflets. 6. *S. bipinnata*.

Stems from a globose tuber; leaf-divisions finely dissected. 7. *S. tuberosa*.

1. *S. arctopoides* H. & A. Herbage of a yellowish green hue; proper stem short (1 to 2 in. long) and simple, from a thickened rootstock, bearing at base a tuft of leaves and above several divergent scape-like mostly decumbent branches, each bearing an umbel of 1 to 3 rays; leaves palmately parted, the division laciniately cleft into spreading segments; rays $3\frac{1}{2}$ in. long or less; involucre foliaceous; umbellets 3 lines in diameter, surrounded by conspicuous involucels of 9 to 13 oblong entire bractlets 5 lines long, or 4 or 5 much shorter than the others; flowers yellow; fruit short-pediceled, $1\frac{1}{2}$ lines long, naked at base, with strong prickles above; seed face nearly plane.

On open or brushy hills, common in the seaward Coast Ranges: Mendocino; Bodega Pt.; Inverness; Mt. Tamalpais; Tiburon; San Francisco; Santa Cruz; Monterey. Mar.-Apr.

2. **S. Menziesii** H. & A. Root fusiform-thickened; stem conspicuously ridged, mostly simple and unbranched, 2 to 5 ft. high or less, with a terminal compound umbel and few to several lateral ones, or with 3 or 4 long-peduncled compound umbels; peduncles long (5 to 10 in.) or short; radical leaves roundish in outline, $2\frac{1}{4}$ to 5 in. broad, palmately 3 to 5-cleft, the divisions again shallowly 2 or 3-cleft with incised-serrate margin, the teeth cuspidate; petioles 6 in. long or less; cauline leaves similar or the divisions narrow and petioles of the uppermost shorter than blade; bracts of involucre toothed; rays in flower about $\frac{1}{2}$ in. long; bractlets lanceolate, entire, 1 line long or less; staminate (sterile) flowers distinctly pediceled, 2 or 3 in each head; perfect (fertile) flowers 6 to 9 in each head, the ovary in fruit becoming pediceled; fruits obovate, 1 to $1\frac{1}{2}$ lines long, covered with hooked prickles, at length divergent.

Most common near or under Oaks in openly wooded country of the foothills: Southern California; Oakland Hills; San Francisco Peninsula; Napa Valley; Solano Co., Marysville Buttes, etc. Mar.-Apr. Fr. May-June.

3. **S. maritima** Kell. Stems 12 or 14 in. high from a thickened rootstock; radical leaves rather numerous, mostly entire or with slightly serrate margin, orbicular or elliptical with cordate base, on long (4 to 6 in.) petioles, blade $1\frac{3}{4}$ in. long or less; cauline leaves mostly 3-parted and more or less toothed, occasionally some of the radical similar; umbels 1 to 3-rayed; rays 1 to 3 in. long; involucre of large foliaceous bracts; involucels of many small lanceolate bractlets; flowers yellow, the staminate ones short-pediceled; fruit nearly naked at base, prickly above.

Lowlands near salt marshes: Alameda; San Francisco.

4. **S. laciniata** H. & A. Stems erect, little branched and few-leaved, $\frac{1}{2}$ to $1\frac{1}{4}$ ft. high; leaves mostly radical, roundish in outline, palmately cleft or parted, the divisions laciniately toothed; cauline leaves and foliaceous involucres similar but more deeply parted into narrower divisions; flowers yellow, in dense globose heads 2 to 3 lines across; umbel with 2 to 5 unequal rays ($\frac{1}{3}$ to $1\frac{1}{2}$ in. long) or partly compound; involucels oblong-ovate or lanceolate, exceeding $\frac{1}{2}$ line; sterile flowers on long pedicels; fruit somewhat naked below, prickly above, $1\frac{1}{2}$ lines long; seed-face deeply grooved and somewhat involute.

Hill slopes near the coast from Marin Co. southward to Southern California. Mar.-Apr.

5. **S. bipinnatifida** Dougl. Slightly succulent; stems branching, leafy below, always erect, 8 in. to 2 ft. high; leaves ovate or orbicular in outline, pinnately 5 to 7-parted or -divided, the divisions laciniately lobed and toothed and decurrent on the toothed rachis; radical leaves including the petiole 4 to 14 in. long; peduncles 4 to 10 in. long; flowers purple, in dense heads, borne on rays 1 or 2 (or even 4) in. long or almost wanting, the umbel simple or partly compound; involucre foliaceous; involucels of about 13 or 14 lanceolate bractlets 2 lines long or less; fruit prickly all over, $1\frac{1}{2}$ to 2 lines long; seed-face concave, with median longitudinal ridge.

Very common everywhere on grassy hills in the Sierra Nevada and Coast Ranges: Mendocino Co.; Solano Co., Napa Valley; Mt. Tamalpais; Oakland Hills; Los Gatos. Apr.

6. *S. bipinnata* H. & A. Stem from an elongated tuber, mostly simple below the inflorescence, commonly 10 to 14 in. high; umbels terminal and lateral, rather long-peduncled; rays $2\frac{1}{2}$ to less than 1 in. long; leaves twice or thrice pinnate; leaflets ovate or oblong, lobed or cleft, mostly 3 to 4 or 6 lines long; flowers yellow, the sterile long-pediceled; fruit naked below, echinate above.

Common in the shade of Oaks and other trees in the low hills of the Coast Ranges from Putah Creek and Vacaville to Contra Costa Co. and southward to Southern California. Also in the Sierra Nevada. Herbage very aromatic, as also in the next.

7. *S. tuberosa* Torr. Stem from a globose tuber, 5 to 9 in. high, simple, or divided at or near the surface of the ground into 2 to 5 long peduncle-like often divergent branches each bearing a more or less compound 1 to 4-rayed umbel; leaves ternately decomposed and very finely dissected, the ultimate segments subulate; involucre foliaceous; involucels of lanceolate or ovate bractlets; flowers yellow, the sterile long-pediceled.

Rocky or gravelly hillsides in the foothills: Coast Ranges (Ukiah, Lake Co., St. Helena); Sierra Nevada (Amador Co. to Nevada Co.). May.

5. SCANDIX L.

Annuals with dissected decomposed leaves. Flowers white, in compound umbels. Rays commonly 2, rarely 1 or 3. Involucre none or of one bract. Involucels of several bractlets. Petals unequal, the outer larger. Fruit linear, flattened laterally, muricate, prolonged into a beak several times longer than the body. Ribs prominent. Oil-tubes none. Seed-face sulcate. (The Greek name.)

1. *S. Pecten-Veneris* L. SHEPHERD'S NEEDLE. Stem simple or branching, erect, 5 to 16 in. high; herbage somewhat hispidulous; leaves 2 or 3 times pinnately dissected into linear acute segments less than $\frac{1}{2}$ line wide; bractlets 2 or 3-toothed at apex or entire; rays $\frac{1}{2}$ to 1 in. long; pedicels very short; body of fruit 4 lines long, bearing a straight flattish beak $1\frac{1}{4}$ in. long, its edges hispidulous.

Naturalized from Europe: Berkeley; Sonoma Valley (1891); Santa Rosa; Napa Valley. May. Fr. June.

6. OSMORRHIZA Raf. SWEET CICELY.

Perennials with thick aromatic roots. Leaves mostly radical and ternately compound. Flowers white, in compound umbels. Calyx-teeth obsolete. Involucre reduced or obsolete. Involucels present or none. Fruit linear or linear-oblong, acute at summit, rather prominently attenuate at base; glabrous and smooth or bristly along the ribs; carpels pentagonal in cross section, with equal ribs. Oil-tubes none in mature fruit. Seed-face concave to very deeply sulcate. (Greek osme, odor, and rhiza, root.)

Ribs with upwardly pointed bristles.

Fruit short-attenuate at base; involuclers present 1. *O. brachypoda*.

Fruit long-attenuate at base; no involuclers 2. *O. nuda*.

Ribs acute, not bristly 3. *O. occidentalis*.

1. *O. brachypoda* Torr. Nearly or quite glabrous, $1\frac{1}{2}$ to $1\frac{3}{4}$ ft. high; leaves ternately compound; leaflets laciniately cleft and serrate, mucronulate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; umbel 1 to 4-rayed, rays 2 in. long; pedicels 1 line long; involucre mostly absent; involuclers of linear acuminate bractlets; fruit 7 to 9 lines long, the ribs armed with bristles pointed upward; seed-face deeply concave or even involute.

Santa Clara Valley, *Goodale*, acc. to Bot. Cal.; Monterey Co.; Sierra Nevada.

2. *O. nuda* Torr. COMMON SWEET CICELY. Stems glabrous, $2\frac{1}{2}$ ft. high or less; leaves hispidulous, especially on the petioles, biternate, 5 in. long, the cauline much reduced; leaflets ovate or elliptical, 3-lobed or -cleft and serrate, often narrowly or broadly cuneate at the entire base, $\frac{1}{2}$ to $2\frac{1}{2}$ in. long; rays 2 to 4 in. long or less; pedicels 4 to 7 lines long; fruit slenderly attenuate at base, upwardly bristly on the ribs, 7 or 8 lines long; seed-face sulcate.

Common in shaded woods near the coast: Mt. Tamalpais; Oakland Hills; Mt. Diablo; San Mateo; Loma Prieta; Santa Cruz. Apr.-May.

3. *O. occidentalis* (Nutt.) Torr. SIERRA SWEET CICELY. Puberulent or nearly glabrous; leaves 2 or 3 times ternate; leaflets oblong-lanceolate, serrate, $1\frac{1}{2}$ to $3\frac{1}{4}$ in. long, some of them sparingly incised or obliquely lobed on one side by a deep incision toward the base; umbel with 5 to 12 rays 1 to 5 in. long; pedicels 1 to 3 lines long; bracts 1 or 2 or none; fruit 7 to 12 lines long, glabrous, with prominent acute not bristly ribs; seed-face very concave.

Sierra Nevada: Mono Pass, *Bolander*; Mariposa Big Tree Road, *Brewer*. Attributed to the Bay Region by Greene.

7. DAUCUS L.

Bristly or hispid annuals or biennials with dissected decompound leaves and white flowers. Umbels compound, concave, surrounded by cleft foliaceous bracts and borne on long peduncles. Involuclers of entire or toothed bractlets. Calyx-teeth obsolete. Fruit somewhat flattened dorsally. Primary ribs slender, bristly; secondary ribs with a single row of prominent barbed prickles. Oil-tubes as in *Caucalis*. (*Daukos*, the Greek name.)

Involucre divided into short linear or lanceolate segments; rays mostly 2 to 5 lines long 1. *D. pusillus*.

Involucre divided into elongated filiform segments; rays 1 to $2\frac{1}{2}$ in. long. 2. *D. Carota*.

1. *D. pusillus* Michx. RATTLESNAKE WEED. Plants commonly 4 to 7 in. high; stems and peduncles retrorsely hispid; leaves finely dissected into linear segments; rays mostly 2 to 5 lines long, sometimes as much as 1 or $1\frac{1}{2}$ in. long, somewhat unequal; pedicels very unequal, commonly 1 or 2 lines long or almost wanting; fruit $1\frac{1}{2}$ to 2 lines long.

Throughout California in the hill country. Apr. "Yerba del Vibora" of the Spanish-Californians.

2. **D. Carota** L. CARROT. Biennial; root fleshy, conical; stems erect, branching, 2 or 3 ft. high, commonly smooth; leaves many times dissected into small linear or lanceolate segments; segments of the involucre linear-lanceolate or subulate; rays very numerous, 1 to 2 in. long; umbels in fruit 2 to 4 in. broad, concave and like a bird's nest; fruit 2 lines long.

Escaped from gardens and naturalized in valley lands: Alameda; Santa Clara Co.; Skyland, Santa Cruz Co., acc. to Davy. July-Sept.

8. CAUCALIS L.

Rough hispidulous annuals with decompound leaves dissected into small segments. Flowers white, in simple or nearly simple umbels. Calyx-teeth prominent. Fruit flattened laterally. Primary ribs 5, filiform, bristly; secondary ribs 4, prominent, winged, bearing barbed or hooked prickles. Oil-tubes solitary in the intervals, *i. e.*, under the secondary ribs, 2 on the commissural side. (Kaukalis, the Greek name.)

Umbels small and condensed, scattered along the stems opposite the leaves, on peduncles 1 or 2 lines long

Umbels terminal or at the upper nodes, on peduncles 1 or 2 in. long

1. *C. nodosa*.

2. *C. microcarpa*.

1. **C. nodosa** Hudson. KNOTTED HEDGE PARSLEY. Erect, the stems with few branches, retrorsely scabrous; leaves pinnate (lower 5 in. long including petiole, the upper successively shorter); leaflets bipinnately dissected; umbels scattered along the stems opposite the leaves, on very short peduncles (1 or 2 lines long), simple or with a supplementary short proliferous umbel; flowers white; fruits $1\frac{1}{2}$ to 2 lines long, those on the outside of the umbel with the exterior carpel densely covered with hooked bristles, the inner carpels as well as the inner fruits smooth or at least only with tubercles.

Introduced from Europe; common in shady places: Vacaville; Calistoga; Lake Lagunitas, Marin Co.; South San Francisco; southern Monterey Co.; Mokelumne Hill; Folsom.

2. **C. microcarpa** H. & A. Erect, slender, 6 to 9 in. high; leaves 2 or 3 times ternate and much dissected, slightly hispid; peduncles solitary at the ends of the branches or in clusters of 2 or 3 at the upper nodes, 1 to 2 in. long, bearing unequally rayed umbels; rays 3 to 6, 8 lines long or less; involucre of foliaceous dissected bracts; involucels of entire or somewhat divided bractlets; fruit oblong, 2 lines long, armed with rows of hooked prickles.

Coast Ranges and Sierra Nevada, widely distributed but not common: Monterey Co.; New Idria; Alcalde, Fresno Co.; Kaweah; Mokelumne Hill; Vaca Mountains; Bodega Pt.; Sites; Butte Co. Apr.-May.

9. APIASTRUM Nutt.

Small branching glabrous annual with dissected leaves. Flowers

small, white, in irregularly compound umbels. Rays and pedicels unequal. Involucre and involucels none. Calyx-teeth wanting. Fruit somewhat laterally compressed, elliptic-cordate, more or less tuberculate, with concave seed-face. Oil-tubes solitary in the intervals, 2 on the face. Seed-face narrowly concave. (*Apium*, Celery, and aster, Latin suffix meaning wild.)

1. ***A. angustifolium* Nutt.** Erect, di- or tri-chotomously branched from the base, 4 to 8 or 15 in. high; leaves opposite below, twice or thrice ternately dissected into linear segments, $\frac{1}{2}$ to 1 in. long; umbels sessile in the forks or opposite the upper leaves, consisting of 2 or 3 umbellets borne on unequal rays (1 in. long or less), and of 1 or 2 usually sessile or sometimes pediceled flowers in the center; umbellets 3 or 4-flowered, the pedicels unequal ($4\frac{1}{2}$ lines long or less) or 1 flower sessile; fruit cordate, broader than high, less than 1 line long, papillate-roughened all over; ribs inconspicuous; carpels concave on the face.

Dry mountain slopes of the Coast Ranges: Lake Co.; Vaca Mountains; Napa Mountains; Mt. Tamalpais; Potrero, San Francisco; San Gregorio; Oakland Hills; Mt. Diablo; foothills of the Santa Clara Valley and Loma Prieta, *Davy*; Pajaro Hills, *Chandler*; Alcalde, and southward to Southern California. Also in the Sierra Nevada (Folsom, Mokelumne Hill). Apr.-May. A plant of peculiarly irregular inflorescence.

10. **CONIUM L.**

Tall branching biennial with dissected decompound leaves. Flowers white, in compound umbels. Involucre and involucels small. Calyx-teeth obsolete. Fruit broadly ovate, somewhat laterally flattened. Ribs prominent. Oil-tubes none. (Ancient Greek name.)

1. ***C. maculatum* L. POISON HEMLOCK.** Stem dotted with purple marks, 4 to 7 ft. high; leaves 1 ft. long or more, the segments incised or pinnatifid; bractlets ovate-lanceolate, commonly 3; rays 10 to 13 or more, less than 1 to $1\frac{1}{4}$ in. long; fruit $1\frac{1}{2}$ lines long; shorter than the pedicels.

Naturalized from Europe: Monterey; Lake Merced; Marin Co.; Berkeley; Lafayette; Mormon Island; Santa Lucia Mountains; San Luis Obispo; Mokelumne Hill. May-June. Herbage unpleasantly odorous when bruised.

11. **VELÆA DC.**

Subglabrous perennials with thick yellow elongated odorous roots. Leaves mostly radical, pinnately or in ours ternately compound. Ours usually without involucre, the involucels in our species of few small lanceolate bracts. Flowers yellow, in compound umbels. Calyx-teeth mostly small. Fruit oblong or orbicular, glabrous or pubescent, somewhat laterally compressed, with prominent equal ribs. Oil-tubes conspicuous, 3 to 6 in the intervals, 4 to 10 on the commissural side. Carpophore undivided. Seed-face strongly involute, enclosing a central cavity. (Sebastin Eugene Vela, student of the Umbelliferæ.)

Leaflets $\frac{1}{2}$ to $\frac{3}{4}$ in. long; bractlets inconspicuous, shorter than the umbellet; fruit 2 lines long or less, with filiform ribs. 1. *V. Kelloggii*.
 Leaflets 1 in. long or more; bractlets conspicuous, some exceeding the umbellet; fruit 3 to 4 lines long, with prominent sharp ribs. 2. *V. Hartwegi*.

1. *V. Kelloggii* (Gray) C. & R. Minutely scabrous, $\frac{3}{4}$ to $1\frac{3}{4}$ ft. high; flowering stems leafless or with a single leaf $\frac{1}{2}$ to 1 ft. above the base; leaves 1 to 2 or 3 times ternate; leaflets ovate or roundish, sharply serrate, incised, the terminal divisions ternate, or quinate, or divided, mostly $\frac{1}{2}$ to 1 in. long; rays about $1\frac{3}{4}$ in. long, in fruit $3\frac{3}{4}$ in. long or less; pedicels 1 to 2 lines long; bractlets inconspicuous, shorter than the umbellets; fruit 1 to 2 lines long, nearly as broad; ribs filiform; oil-tubes 3 in the dorsal intervals, 5 to 6 in the laterals, 8 to 10 on the commissural side.—(*Deweya Kelloggii* Gray.)

Rather rare: Mission Hills, San Francisco, *Bolander* acc. to Gray; Mt. Tamalpais, *Jepson*; Bolinas Bay, *Kellogg*, who first collected it; Petaluma, fide Coulter & Rose; Monterey Co., *Eastwood*; Fort Tejon acc. to Coville. A more slender plant than the next.

2. *V. Hartwegi* (Gray) C. & R. Acaulescent, mostly cæspitose, 1 to 3 ft. high; caudex much branched, crowning a taproot which penetrates vertically to a depth of 2 ft. or more and is $\frac{3}{4}$ to 1 in. in diameter; scapes and petioles somewhat scabrous; leaves biternately divided, or a portion triternately divided, the ultimate lateral divisions mostly 3-foliolate, the ultimate middle divisions mostly 5-foliolate; leaflets ovate or oblong, sparingly incised, serrate, mucronate, nearly 1 to 2 in. long, or the leaflets often more or less confluent; petioles 2 to 6 in. long; rays about 15, 2 in. long or less; bracts none; bractlets 3 to 6, unequal, linear-lanceolate, long-pointed, exteriorly disposed, mostly surpassing the umbellets; flowering pedicels less than 1 line long; fruit nearly orbicular, smooth, 3 to 4 lines long; ribs filiform; oil-tubes as in the last.—(*Deweya Hartwegi* Gray.)

Higher slopes in the hills, somewhat rare in our district. Mt. Diablo; Niles; Oakland Hills; San Luis Obispo Co.; Sierra Foothills, Upper Sacramento Valley, where first collected by Hartweg in 1847; Folsom; Amador Co.; Mariposa Co.; Sequoia Mills; Kern Co. Last of Mar.—Apr. Fr. July.

12. APIUM L.

Ours erect glabrous biennial with fibrous roots and pinnately divided leaves. Stems tri- or di-chotomously branched, forming a paniculate inflorescence, the compound umbels terminal on the branches and subsessile in the forks. Involucre and involuclers small or none, or the former sometimes foliaceous. Flowers white, in compound umbels. Calyx-teeth obsolete. Fruit elliptic-ovate or broader than long. Ribs prominent, obtuse, equal. Oil-tubes solitary in the intervals, 2 on the commissural side. Seed-face plane. (Old Latin name of Celery.)

1. *A. graveolens* L. COMMON CELERY. Erect, 3 or 4 ft. high; lower leaves long-petioled, leaflets 5 (or 7 or 9), $1\frac{1}{4}$ to 3 in. long and as broad or broader, coarsely toothed and 3-cleft or even -divided;

upper leaves on short petioles or sessile, the leaflets 3; rays 4 to 12 lines long; fruit $\frac{1}{2}$ to $\frac{3}{4}$ lines long.

An escape from gardens, common in marshes: Monterey; Soquel Creek near Skyland, acc. to Davy; Berkeley; Suisun Marshes. July-Aug.

13. **CICUTA L. WATER HEMLOCK.**

Tall branching glabrous perennials growing in marshes or by stream banks. Rootstocks short and erect, or horizontal and branching. Leaves pinnately or ternately compound. Flowers white, in compound umbels. Calyx-teeth somewhat prominent. Involucre present or none. Involucels of small bractlets. Fruit oblong to orbicular, glabrous. Ribs corky, broad but low, the lateral in cross-section evidently larger than the intermediate and dorsal. Oil-tubes 2 on the face, solitary in the intervals. (Classical name of the Hemlock, which was given to criminals, and sometimes to philosophers, as poison.)

Involucre none or of a single bract; fruit 1 to nearly $1\frac{1}{2}$ lines long; species of hill streams: var. *Californica* of 1. *C. virosa*.
Involucre of several to many lanceolate bracts; fruit nearly 2 lines long; salt marsh species. 2. *C. Bolanderi*.

1. **C. virosa L. var. Californica C. & R. CALIFORNIA WATER HEMLOCK.** Stems about 3 ft. high; rootstock horizontal, much branched, giving off below coarse fibrous roots; radical leaves pinnate or partly bipinnate below, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, on long ($\frac{1}{2}$ to $1\frac{1}{2}$ ft.) petioles; leaflets ovate-lanceolate or lanceolate, serrate, 3 to 4 in. long, often deeply 1-lobed on one side towards the base; rays somewhat unequal, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long; pedicels 2 to 4 lines long; involucre none, or merely 1 narrow bract; bractlets several, ovate, acuminate; fruit 1 to $1\frac{1}{4}$ lines long with narrow not depressed oil-tubes, those on the face approximate near the median line.—(*C. Californica* Gray.)

Margins of streams in the region of the Coast Redwood: Oakland Hills; San Francisco; Santa Cruz; Monterey. July-Aug.

2. **C. Bolanderi Wats.** Rootstock vertical or nearly so; stem branched above, seldom less than 6 ft. high, often 3 or 4 ft. higher, with large radical and cauline bipinnate leaves 2 ft. long or less; leaflets lanceolate, serrate, 2 in. long; bracts and bractlets lanceolate, the former often scarious-margined; rays $1\frac{1}{2}$ in. long, subequal, pedicels 2 lines long; fruit orbicular, 2 lines long, prominently ribbed, the quite mature carpels rather strongly concave on the face, thus appearing somewhat lunate; oil-tubes broad, depressed in the channeled seed.

A tall and conspicuous plant in the Suisun Marshes; also found in the Alvarado Marshes acc. to Dr. Behr. Sept.-Oct.

14. **AMMI L.**

Erect branching glabrous biennial, with slightly fusiform roots and dissected decompound leaves. Flowers white in compound umbels. Bracts parted into filiform segments. Bractlets lanceolate, acuminate. Flowers white, in a terminal compound umbel with long rays and

short pedicels. Calyx-teeth obsolete. Fruit ovoid, very slightly flattened laterally. Ribs filiform. Oil-tubes solitary in the intervals and 2 on the face. (Greek name of an umbelliferous plant.)

1. **A. majus** L. Stem slender, branching above, $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high; leaves tritermately dissected into small spatulate segments (2 to 6 lines long), which are lacinate or serrulate at apex; rays about 25 to 30, little unequal, $\frac{3}{4}$ to 2 in. long; pedicels 1 to $1\frac{1}{2}$ lines long; bracts linear below, parted above into 3 filiform divisions; bractlets lanceolate, acuminate, entire, scarious-margined at base; fruit less than 1 line long; carpels with concave face; oil-tubes solitary in the intervals, 2 on the commissural side.

Low places in grain fields near Yountville, 1893; Alvarado Marshes, 1897. Naturalized from Europe. First record of its occurrence in the New World as an established weed.

15. **CARUM** L.

Ours erect and slender glabrous biennials or perennials. Leaves simply pinnate with few linear entire leaflets. Flowers white, in compound umbels. Involucre of entire bracts or none. Involucels of entire bractlets. Calyx-teeth small. Stylopodium conical. Fruit ovate or oblong, laterally compressed, with obtuse ribs. Oil-tubes solitary in the intervals, 2 on the face. (Karon, Greek name of the Caraway.)

Stems clustered, from a fascicle of coarse roots; fruit 3 lines long.

Stem solitary, from a tuber or cluster of tubers; fruit about 1 line long.

1. *C. Kelloggii*.

2. *C. Gairdneri*.

1. **C. Kelloggii** Gray. Stems several from a fascicle of coarse and hard fibrous roots, 3 to 5 ft. high; radical leaves 5 to 10 in. long, ternate, each division pinnate with narrowly linear divisions 3 or 4 in. long; cauline leaves similar but smaller; involucre of bracts and involucel bractlets several, lanceolate or subulate; rays $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; fruit 3 lines long; carpels frequently unequal or only one maturing.

Very common in the open hill country about San Francisco Bay: Oakland Hills; Vaca Hills; Napa Mountains; San Francisco Peninsula. Fl. July. Fr. Aug.-Oct.

2. **C. Gairdneri** Gray. Stem solitary, 14 to 21 in. high, from a tuberous root or a fascicle of such; leaves few, simply pinnate, with 3 to 7 linear leaflets 2 to 6 in. long; upper leaves mostly simple; rays 3 to 6 lines long; involucre of several bracts or none; involucels of linear acuminate bractlets; fruit ovate, 1 line long or a trifle more or less; styles long.

Not rare in open woods of the Coast Range Hills: Napa Mountains to the Oakland Hills, southward to Southern California and northward to British Columbia. July. Fr. Oct.

16. **PIMPINELLA** L.

Glabrous perennials with decompose leaves. Flowers white or pinkish in ours, in compound umbels. Involucre and involucels

none. Calyx-teeth obsolete. Fruit ovate, with a broad commissure. Ribs slender, equal, distant. Oil-tubes numerous, 2 to 6 in the intervals, several on the face. (Connected with Latin *pampinus*, a tendril, the application not obvious.)

1. *P. apiodora* Gray. PIMPINEL. Erect, 2 or 3 ft. high; leaves mostly radical, 2 or 3 times ternate; leaflets ovate in outline, laciniately pinnatifid and serrate, 1 to $1\frac{1}{2}$ in. long; umbels long-peduncled; rays 14 to 20, 1 to 2 in. long; fruit broadly ovate, $1\frac{1}{2}$ lines long; oil-tubes 4 or 5 in the dorsal intervals, about 6 in each lateral, 8 or more on the commissural side.

Rocky places about the summits of the Mission Hills, San Francisco; Point Reyes, on bushy hills, and northward to Mendocino Co. June.

17. SIUM L. WATER PARSNIP.

Glabrous perennial marsh or aquatic herbs. Cauline leaves simply pinnate. Flowers white in compound umbels. Bracts and bractlets several to many. Calyx-teeth minute. Styles short. Stylopodium depressed. Fruit ovate or oblong, somewhat laterally compressed, with narrow commissure. Ribs prominent, corky. Oil-tubes 2 or 3 in the intervals, at least in some of the intervals. (Sion, Greek name of some water plant.)

1. *S. cicutæfolium* Gmel. var. *heterophyllum*. Stem stout, $2\frac{1}{2}$ to $3\frac{1}{2}$ ft. high, from a cluster of fleshy fibrous roots, angular and more or less flexuous; lowest leaves sometimes simple, on long fistulous petioles, serrate or lacinate, or pinnate like the cauline, $3\frac{1}{2}$ ft. long or less; leaflets 5 to 13, broadly lanceolate, serrate, 3 to 4 in. long; bracts lanceolate, over $\frac{1}{2}$ in. long, scarious-margined below; bractlets ovate-lanceolate, $1\frac{1}{2}$ lines long; fruit ovoid, 2 lines long, with acute ribs; oil-tubes 2 on the face, 2 or 3 in the intervals, occasionally solitary.—(*S. heterophyllum* Greene.)

Salt marshes: Suisun Marshes; Stockton.

18. CRANTZIA Nutt.

Small glabrous perennials. Stems fistulous, creeping and rooting in the mud, only the leaves and short peduncles erect. Leaves reduced to hollow cylindrical petioles jointed by transverse partitions. Flowers dull white or slightly tinged with pinkish brown, in a few-flowered umbel. Bracts of the involucre minute. Fruit subglobose. Dorsal ribs filiform, the lateral corky and thickened next to the commissure. Oil-tubes solitary in the intervals, 2 on the commissural side.

1. *C. lineata* Nutt. Leaves 1 to 8 in. long, 1 to 2 lines wide; peduncles 1 in. long or less; fruiting pedicels $1\frac{1}{2}$ to 3 lines long; petals plane; fruit 1 line long.

Salt marshes or brackish mud flats: Point Reyes, *Davy*; Port Costa to Martinez; river banks at Antioch; Robert's Island, acc. to *Mrs. K. Brandegee*.

19. CENANTHE L.

Aquatic glabrous herbs with succulent stem from thick rootstocks.

Leaves pinnately compound. Flowers white in compound umbels, terminating the branches. Involucre present or none. Involucels present. Calyx-teeth rather prominent. Styles slender, at length elongated. Fruit globose-ovate, cylindric or slightly flattened laterally. Ribs broad, obtuse, corky; commissural face also corky. Oil-tubes solitary in the intervals, 2 on the face, the seed furrowed beneath them. (Ancient Greek name of some thorny plant.)

Fruit subcylindric, 2 lines long 1. *Æ. Californica*.
 Fruit ovate-globose, 1 line long 2. *Æ. sarmentosa*.

1. *Æ. Californica* Wats. Erect, 2 to 4 ft. high; leaves bipinnate; leaflets elliptic-ovate in outline, 3-cleft or -parted and also coarsely toothed or incised, those of the upper leaves crowded on the rachis and sometimes tending to be conduplicate; rays less than 1 to 2 in. long; bracts few or none; bractlets several to many, lanceolate and shorter than the pedicels; fruit cylindric, 2 lines long, crowded.

Usually in dense masses on the margins of slow streams and shallow pools or ponds; common in the Coast Ranges. In autumn the summits of the stems may give rise to very slender runner-like branches 3 to 5 ft. long, which produce at intervals bulblets $\frac{1}{2}$ in. in diameter or less. June. Fruiting Aug.-Sept. A specimen from the Coyote Hills, Alameda Co., has many linear-spatulate bractlets much surpassing the umbellets and commonly serrulate at apex.

2. *Æ. sarmentosa* Presl. Three or 4 ft. high; leaves simply pinnate; leaflets 5 to 13, 6 in. long or less, ovate-lanceolate, the lower obliquely lobed on the lower side or with an almost distinct supplementary leaflet; rays 1 to 2 in. long; bracts few or none; bractlets lanceolate, acuminate; fruit subglobose or somewhat ovatis, 1 line long, the corky ribs somewhat turgid.

Carmel River, Monterey Co., and northward along the coast; rare with us.

20. *BERULA* Hoffm.

Glabrous marsh perennial with pinnate leaves and serrate leaflets. Flowers white, in terminal compound umbels. Bracts narrow. Bractlets unequal, 1 or 2 surpassing the flowers. Fruit subglobose, glabrous, surrounded by a continuous corky covering of confluent ribs. Oil-tubes numerous and contiguous, in the mature fruit more or less confluent, closely surrounding the seed cavity. (Latin name of the Water-cress.)

1. *B. erecta* (Huds.) Coville. WATER PARSNIP. Erect, corymbosely branching above, 3 ft. high; leaves simply pinnate; leaflets 9 to 19, 1 or 2 in. long, ovate to linear, serrate or laciniately lobed; umbels many-rayed; rays $\frac{1}{2}$ to 2 in. long in fruit; pedicels 2 to 3 lines long; fruit less than 1 line long.—(*Sium angustifolium* L.)

Los Angeles, *Nevin*; San Mateo, acc. to *Greene*.

21. *FŒNICULUM* Adans.

Stout glabrous perennial with dark green aromatic herbage. Leaves decomposed, dissected into numerous filiform segments.

Flowers yellow, in large compound umbels. Involucre and involucels none. Calyx-teeth obsolete. Fruit oblong. Ribs prominent. Oil-tubes solitary in the intervals, 2 on the commissural side. (Diminutive of Latin *fœnum*, hay, from its odor.)

1. **F. vulgare** Gært. SWEET FENNEL. Glaucous; stems striate, branching, 3 to 6 ft. high; rays $\frac{1}{2}$ to $2\frac{1}{2}$ in. long; fruit 2 lines long.

Waste places on old farms and by country lanes, flowering in summer: Solano Co.; Napa Valley; Berkeley, etc.

22. SELINUM L.

Tall branching perennials with pinnately decompound leaves. Flowers white in compound umbels. Involucre of few bracts. Involucels of many bractlets. Calyx-teeth obsolete. Fruit oblong to obovate, flattened dorsally, glabrous or pubescent, with rather prominent disk. Ribs winged, the lateral usually broadest. Oil-tubes solitary in the intervals, 2 to 4 on the commissural side. (Selinon, Greek name of the Parsley.)

1. **S. Pacificum** Wats. Leaves ternate and bipinnate, the ovate acutish segments 1 in. long and laciniately toothed and lobed; umbels on stout peduncles, about 15-rayed; involucre conspicuous, its bracts 2 or 3, lobed and toothed, 1 in. long and equaling the rays; involucels of several narrowly linear entire or 3-toothed bractlets, equaling the flowers; pedicels slender; fruit smooth, oblong, 3 or 4 lines long; wings thin, rather narrow; stylopodium slightly prominent above the disk; oil-tubes conspicuous, very rarely in pairs, the dorsal ones sunk in the body of the seed.

Little known: Sausalito Hills, *Kellogg* and *Harford*, first collected over thirty years ago. **S. CAPITELLATUM** (Gray) B. & H., common in the Sierra Nevada at middle altitudes, may be known by its tomentose inflorescence and inconspicuous deciduous bractlets.

23. ANGELICA L.

Stout perennials with ternately or pinnately compound leaves. Flowers white in large terminal compound umbels. Involucre scanty or none. Involucels of small bractlets or none. Calyx-teeth mostly obsolete. Fruit strongly compressed, elliptic-oblong in outline. Ribs prominent, the lateral broadly winged, the others often narrowly winged. Oil-tubes 1 to 3 in the intervals, 2 to 4 on the commissural face. (Latin *angelica*, on account of its medicinal properties.)

Herbage hoary; umbels rather condensed; rays equal, in flower 1 to $1\frac{1}{2}$ in. long; bractlets many, linear, acuminate 1. *A. Hendersoni*.
Herbage finely tomentose or roughish pubescent; rays unequal, in flower 1 to 4 or 6 in. long; bractlets none, or few and setaceous . 2. *A. tomentosa*.

1. **A. Hendersoni** C. & R. Very stout and densely tomentose, especially on the inflorescence, and whitened under surface of the leaves; leaves quinate, then pinnate; leaflets thick, broadly ovate, 3 to 4 in. long, obtuse, serrate; rays in flower equal, about $1\frac{1}{4}$ in. long; pedicels 1 line long or less; bractlets many, linear-acuminate; fruit

broadly oblong, slightly pubescent, 3 to 4 lines long; lateral wings thick and corky, as broad as the body; seed deeply sulcate beneath the oil-tubes.

Point Lobos, San Francisco, and northward along the coast beyond the state boundary. July-Aug.

2. **A. tomentosa** Wats. Stout, 2 to 5 ft. high, the stems and especially the leaves finely tomentose, roughish-pubescent, or nearly glabrous; leaves ternate, then pinnate; leaflets 2 to 3 in. long, ovate or almost round, 3-lobed or obliquely 2-lobed, or not lobed and merely oblique, irregularly serrate; petioles very much dilated at base; rays $1\frac{1}{4}$ to 4 in. long; pedicels 2 or 3 lines long; fruit oblong or elliptical, glabrous, 3 to $4\frac{1}{2}$ lines long; dorsal and intermediate ribs small and acutish; lateral wings nearly equaling the body in breadth; oil-tubes 2 on the commissural side; seed somewhat sulcate beneath the oil-tubes.

Near the coast: San Francisco and Marin Co.

Var. **elata**. Five to 8 ft. high; radical leaves as much as 4 ft. long; leaflets ovate-lanceolate or lanceolate, grayish puberulent, 4 to 6 in. long.—Common in the cañons and mountains about Napa Valley.

Var. **Californica** (A. *Californica* Jepson). Roughish puberulent on the leaves and ends of the rays, the stem glabrous; leaves biternate or quinate, then once pinnate or partially bipinnate; leaflets ovate, 2 in. long, the terminal mostly 3-lobed at summit, the lower often lobed or divided at base, all irregularly serrate with the serratures mucronulate; rays unequal, 1 to 6 in. long; pedicels subequal, 3 lines long; dorsal and intermediate ribs often winged; oil-tubes 2 or 3 in the intervals, 2 on the face.—Vaca Mountains. May-June. Fr. July-Aug.

24. LEPTOTÆNIA Nutt.

Tall stoutish glabrous perennials with thick fusiform roots and pinnately compound leaves. Flowers yellow or purple, in compound umbels. Involucre of few bracts or none. Involucels of small and numerous bractlets or none. Fruit oblong to suborbicular, strongly compressed. Lateral ribs with broad corky-thickened wings coherent until maturity. Dorsal and intermediate ribs filiform and approximate. Oil-tubes 1 to 8 in the intervals, 2 to 10 on the commissural side. (Greek leptos, narrow, and tainia, vittæ or oil-tubes.)

Leaflets 3-lobed or -parted, 1 in. long or more; involucels none; oil-tubes present

Leaflets dissected into small linear lobes; involucels present; oil-tubes none.

1. *L. Californica*.

2. *L. dissecta*.

1. **L. Californica** Nutt. Erect, 2 or 3 ft. high; glaucous; leaves once or twice ternate, then pinnate; leaflets 1 in. long or more, cuneate-orbicular or -obovate, 3-lobed or the terminal 3-parted, serrate above; peduncles at summit abruptly widened into a disk-like dilatation; rays subequal, 2 to 3 in. long; pedicels $1\frac{1}{2}$ to 3 lines long; fruit elliptical, narrowly winged, 4 lines long; oil-tubes 6 to 10 on the face (the lateral frequently anastomosing), 3 or 4 in the intervals.

Coast Range Mountains: Napa Valley to Mendocino Co., acc. to Bot. Cal. Mar.-Apr. Fr. June. Var. *PLATYCARPA* Jepson. Four ft. high; fruit more broadly winged, 7 lines long.—Vaca Mountains.

2. *L. dissecta* Nutt. Stems many from a thick root, leafy at base; leaves broad, 2 or 3 times ternate and then once or twice pinnate, the segments incised-pinnatifid; peduncles 1 to 2 ft. long; rays 2 to 5 in. long; involucre of few bracts or none; involuclers of several lanceolate bractlets; flowers yellow or purplish; fruit oblong, 5 to 9 lines long; oil-tubes none or very obscure.

Coast Ranges and Sierra Nevada: Mendocino Co. and Lake Co., acc. to Bot. Cal.; to be expected within our limits. Apr.-June.

25. PEUCEDANUM L.

Ours mostly low perennials of dry ground, either acaulescent or short caulescent. Roots thick or fusiform. Flowers white or yellow, in compound umbels. Involucre in ours none, except 2 species. Involuclers usually present. Fruit suborbicular to oblong, much compressed. Lateral ribs with broad thin wings coherent until maturity with those of the companion carpel. Oil-tubes 1 to several in the intervals, 2 to several on the commissural side. (The ancient Greek name.)

Peduncles and pedicels conspicuously swollen at summit; bractlets none; flowers yellow; fruit glabrous. 1. *P. leiocarpum*.
Peduncles not enlarged at summit.

Leaves ternate and pinnate, with broad leaflets.

Leaflets ovate in outline, serrate and more or less incised; fruit 3 to 3½ lines long. 2. *P. parvifolium*.

Leaflets roundish, serrate, often 3-lobed but the lobes broad; fruit 6 to 8 lines long, nearly or quite as broad. 3. *P. Hassei*.

Leaves decomposed and much dissected into small linear or filiform segments.

Flowers white; bractlets more or less united into a 1-sided involucler.

Fruit glabrous; oil-tubes solitary in the intervals. 4. *P. macrocarpum*.

Fruit tomentose or pubescent; oil-tubes 2 or 3 in the intervals, rarely solitary. 5. *P. dasycarpum*.

Flowers yellow; bractlets distinct.

Oil-tubes solitary in the intervals.

Bract 1 or none; body of fruit on a distinct stipe, the stipe and body with a wing twice as broad as body. 6. *P. Vaseyi*.

Bracts 1 to 3; bractlets scarious-margined; wing of fruit scarcely as wide as body. 7. *P. utriculatum*.

Oil-tubes none in the intervals or indistinct; wing ½ to almost as wide as body; bracts none. 8. *P. caruifolium*.

1. *P. leiocarpum* Nutt. Acaulescent, 1½ to 2 ft. high, glabrous; root fleshy, the epidermis horizontally corrugated; leaves 4 to 6 in. long, once or twice ternate, then pinnate with about 5 or 7 leaflets; leaflets lanceolate or oblanceolate to broadly ovate, 1 to 2 in. long, toothed at apex; peduncles often very stout, conspicuously enlarged at summit and bearing an umbel of 6 to 18 very unequal rays; rays more or less dilated at apex, 2 to 6 in. long in fruit; pedicels 1½ to 2 lines long; bracts or bractlets none; flowers yellow; fruit 4 to 5 lines long, 2½ to 3 lines wide; wings about as broad as body of fruit; oil-tubes broad, solitary in the intervals, 4 or 6 on the commissural face; when 6, 4 are disposed in lateral pairs.—(*P. robustum* Jepson.)

North Coast Ranges: Santa Rosa; Sonoma; Napa Valley; plains of Solano Co., and northward.

2. **P. parvifolium** T. & G. Acaulescent or very short caulescent, 6 to 10 in. high, glabrous; leaves 3 or 4 in. long, ternate, then pinnately divided into 3 or 5 leaflets, or the upper leaflets confluent; leaflets ovate, mostly cuneate at base, 2 or 3-cleft, incised or serrate, the teeth strongly cuspidate, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; peduncles 1 to 3; rays about 10, unequal, $\frac{1}{2}$ to 2 in. long; pedicels 3 to $4\frac{1}{2}$ lines long; bractlets subulate; fruit broadly elliptical to orbicular, 3 to $3\frac{1}{2}$ lines long, the wings broader than the body; oil-tubes solitary in the intervals, 2 to 4 on the commissural side.

Mountain summits west of Gilroy, *Setchell* and *Jepson*; Monterey to San Luis Obispo, acc. to Coulter and Rose. May.

3. **P. Hassei** C. & R. Nearly acaulescent, 16 in. high, glabrous and glaucous; leaves ternate and pinnate; leaflets roundish, cuspidately serrate, frequently 3-lobed, $\frac{3}{4}$ to $1\frac{1}{2}$ in. broad; peduncles several; rays 11 to 18; bractlets ovate or lanceolate, or mostly one and that laciniately cleft; fruit 6 to 8 lines long, nearly or quite as broad, very broadly winged, emarginate at base and apex; oil-tubes 4 on the face, solitary in the intervals with occasionally an additional one in one of the lateral intervals.

Summits of the inner and middle North Coast Ranges: Vaca Mountains; Mt. St. Helena; Caux's Knob; first collected by Dr. H. E. Hasse in Southern California.

4. **P. macrocarpum** Nutt. Short caulescent, 10 to 17 in. high, the stems several from a caudex which crowns an elongated tuberous root; herbage with a short scattered pubescence; leaves about two times ternate and twice pinnately divided, the segments linear, acuminate, $\frac{1}{2}$ line wide and 1 to 3 lines long, the ultimate divisions of the rachis winged; earliest radical leaves often as much as 1 ft. long, the latter scarcely $\frac{1}{2}$ as long; fruiting rays equal, $1\frac{1}{4}$ to 2 in. long; pedicels 3 to 4 lines long; bractlets united at base, toothed or lacinate above; ovary and fruit glabrous, varying from oblong or somewhat quadrangular to narrowly ovate, 6 to 8 lines long, 2 to 4 lines broad; ribs inconspicuous or almost obsolete; oil-tubes 1 to each interval, 5 or 6 on the commissural face; commissure distinctly convex at maturity; seed sharply channeled beneath the oil-tubes of the dorsal intervals; wings commonly broader, sometimes narrower than the body.

Dry hillsides from Monterey and Santa Clara Cos. to Antioch, and northward to Red Bluff, mostly or only in the inner Coast Ranges except at the south.

5. **P. dasycarpum** T. & G. Nearly acaulescent, the peduncles several from a stout taproot, erect or ascending, 6 to 15 in. high; herbage with a short stiffish pubescence; leaves ternately decomposed and dissected into small narrowly linear segments; segments 1 or 2 lines long and less than $\frac{1}{2}$ line wide; fertile rays 6 to 11, 1 to $2\frac{1}{2}$ in. long; pedicels in fruit 3 to 6 lines long; involucels unilateral, com-

posed of several ovate or lanceolate more or less united bractlets; ovary tomentose or conspicuously woolly; fruit suborbicular, 4 or 5 lines long and nearly or quite as broad; wings quite as broad or broader than body; oil-tubes variable, 2 or 3 in the intervals or sometimes 1, 4 or 2 on the commissural face.

Bushy hills, open woods, or in the valleys of the Coast Ranges: mountains west of Gilroy; San Francisco; Mt. Diablo; Marin Co.; Napa Mountains; Vaca Mountains. Apr.-May.

6. *P. Vaseyi* C. & R. Nearly acaulescent, the peduncles erect or ascending, $3\frac{1}{2}$ to 6 in. high; petioles inflated; leaves 2 to $5\frac{1}{2}$ in. long; leaf-segments oblong, mucronulate, 1 line long or less, hirsutulous on the margins and rachis; rays 8 to 16, 1 to 2 in. long in fruit; pedicels 4 or 5 lines long; bract 1 or none; bractlets few, obovate, crisped or toothed; flowers yellow; fruit broadly oblong, 6 lines long, 4 lines broad, emarginate; body of fruit 4 lines long, raised on a stipe 2 lines long, both the stipe and the body with broad wings twice as wide as the body; wings in mature fruit usually reddish; oil-tubes solitary in the intervals, 4 on the commissural side.

Summit of the Mayacamas Mountains, Pope Valley grade from Calistoga; Mt. San Carlos, Fresno Co.; Sierra Nevada. Apr.-May.

7. *P. utriculatum* Nutt. Caulescent, suberect, branching at the base, 12 to 16 in. high, or near the sea low and decumbent; leaves pubescent, triterately dissected into linear segments 1 to 5 lines long; petioles conspicuously dilated; rays unequal, the fertile 1 to 3 in. long; pedicels 3 lines long or less; involucre of 1 to 3 bracts; bractlets several, lanceolate or obovate, scarious-margined toward the base, mucronate, sessile or with a petiole-like base; fruits $2\frac{1}{2}$ to 4 lines long, elliptical or oblong, glabrous; wings scarcely as wide as body; oil-tubes 4 to 6 on the face, solitary in the intervals or with short accessory ones in the dorsal intervals; seed-face slightly concave.

Common everywhere on open hillsides in the Sierra Nevada and Coast Ranges: Red Bluff; Solano Co.; Sonoma; Berkeley; Santa Clara Co.; Amador Co.; San Joaquin Co. and Kern Co. Scented like the English Cowslip, acc. to Davy. Mar.

8. *P. caruifolium* T. & G. Very nearly acaulescent; peduncles erect, 3 or 4 from a common root, 8 to 14 in. high; leaves hispidulous, triterately and very much dissected into linear segments; segments 3 to 6 lines long and $\frac{1}{2}$ line wide or less; fertile rays 1 to $1\frac{1}{2}$ in. long; pedicels $1\frac{1}{2}$ to 2 lines long; involucre none; involucels of distinct or nearly distinct broadly ovate or oblong segments, entire or toothed at apex, often borne on a petiole-like base; fruit glabrous, 3 to 5 lines long; wings $\frac{1}{2}$ to almost as wide as body; oil-tubes none on the face, none in the intervals or indistinct.

Low ground: Red Bluff; Yolo Co.; Solano Co.; San Joaquin Valley; San Francisco and southward. Mar.-Apr. Fr. May.

26. PASTINACA L.

Tall branching biennial with angular or fluted leafy stems from

thick roots. Leaves large, pinnate. Flowers yellow, in compound umbels. Involucre and involuclers small or commonly none. Fruit oval, glabrous, strongly compressed. Lateral ribs winged; dorsal and intermediate ribs filiform. Oil-tubes solitary in the intervals, 2 to 4 on the commissural face. (Latin name of the Parsnip.)

1. *P. sativa* L. COMMON PARSNIP. Three or 4 ft. high; leaflets ovate, serrate, somewhat incised or even widely 3-lobed, 3 or 4 in. long; rays 15 to 20, 1 to 2½ in. long; fruit nearly orbicular, 2½ to 3 lines long; oil-tubes conspicuous.

Escaped from gardens: Lake Co.; Sacramento.

27. HERACLEUM L.

Tall stout perennials with very large ternately compound leaves and broad sheathing petioles. Flowers white, in a large many-rayed umbel. Involucre deciduous. Involuclers of numerous bractlets. Petals obcordate, the marginal ones of the umbel much larger. Fruit almost round, strongly compressed. Lateral ribs with a thin wing; dorsal and intermediate ribs filiform. Oil-tubes 2 on the commissural side, 1 in each interval, visible from the outside and reaching from the summit to about the middle of the carpels. (Named for Hercules, who, it is said, first used it in medicine.)

1. *H. lanatum* Michx. COW PARSNIP. Four or 5 ft. high; leaflets 3, petiolulate, ovate or orbicular, sharply serrate and lobed, 3 to 6 in. broad; umbels 6 to 10 in. broad; fruit 3½ to 5 lines long.

Common on brushy north slopes in the outer (or seaward) Coast Ranges (San Francisco; Oakland Hills; Marin Co.; Bodega Pt.) and in wet soil at middle altitudes in the Sierra Nevada.

73. CORNACEÆ. DOGWOOD FAMILY.

Deciduous trees or shrubs, or some species low and herbaceous. Leaves opposite, simple, entire. Flowers 4-merous in cymes or heads. Calyx-tube coherent with the ovary, its limb 4-lobed or obsolete. Petals 4, epigynous, valvate in bud. Stamens 4, alternate with the petals. Ovary 2-celled with a single pendulous ovule in each cell; style filiform; stigma simple. Fruit a drupe, 1 or 2-seeded. Embryo minute.

1. CORNUS L. CORNEL. DOGWOOD.

Flowers perfect, greenish or white, disposed in cymes or capitate. Calyx-limb of 4 small teeth around the summit of the ovary. Stamens with slender filaments. Style simple. Fruit a drupe, the stone 2-celled with 1 seed in each cell. (Latin cornu, a horn, on account of the hardness of the wood.)

Flowers sessile in a head-like cluster with an involucre of 4 to 6 large white petal-like bracts 1. *C. Nuttallii*.
Flowers in cymes.

Leaves ovate to elliptical, lighter colored beneath, 2 to 4 in. long; fruit white; stone conspicuously channeled on the edges: var. *Californica* of 2. *C. pubescens*.

Leaves narrower, 1 to 2½ in. long; stone not channeled on the edges or obscurely so.

Stone little compressed; leaves thin, narrowly obovate or oblong, green, and nearly alike on both faces 3. *C. glabrata*.

Stone pointed at base, tubercled at apex; leaves mostly ovate-lanceolate, purplish 4. *C. Torreyi*.

1. **C. Nuttallii** Aud. NUTTALL'S DOGWOOD. Tree, 10 to 15 ft. high, with ascending or widely spreading branches and smooth bark; leaves narrow- or elliptic-obovate or even orbicular, with rounded or shortly acute apex, 3 to 5 in. long, on petioles 1 in. long or less; flowers crowded on a thick convex receptacle and surrounded by a conspicuous petal-like involucre; bracts of the involucre white, sometimes tinged with red, commonly 6, obovate to oblong, 1½ to 3 in. long, abruptly acute or acuminate; head ½ to 1 in. broad, very dense; drupe 5 to 6 lines long, scarlet.

Marin Co. and Napa Valley northward through the Coast Ranges to Mt. Shasta, thence southward in the Sierra Nevada; rare in the South Coast Ranges (Monterey Co., acc. to Bot. Cal., Santa Cruz Mountains); San Diego Co. Flowers remarkably beautiful, appearing with or before the leaves.

C. CANADENSIS L. BUNCH-BERRY. Herbaceous; stem 3 to 6 in. high with a whorl of 6 leaves at summit, a pair of leaves above the middle, and scales below; involucre also petal-like.—Mendocino Co. and northward. **C. SESSILIS** Torr. Shrub 10 ft. high or more, with yellowish flowers in sessile umbels subtended by 4 small caducous bracts.—Northern Sierra Nevada.

2. **C. pubescens** Nutt. var. **Californica** C. & E. COMMON DOGWOOD. Shrub, 5 to 15 ft. high with smooth purplish branches and branchlets; leaves commonly ovate, varying to elliptical, acute, lighter colored and more pubescent, also conspicuously ribbed, beneath; cymes 1½ to 2 in. broad; petals oblong, acute, 2 lines long; style glabrous, little or not at all thickened at apex; drupe white, subglobose, 3 lines in diameter; stone somewhat flattened, mostly oblique, with furrowed edges, each side with 4 less obvious or shallower channels.—(*C. Californica* C. A. Mey.)

Common on stream-banks in the Coast Ranges and Sierra Nevada, especially in cañons; also along the Sacramento and San Joaquin Rivers. Flowering and fruiting from Apr. until Nov. or later. Stone in shape and appearance very similar to the fruit of *Rhus diversiloba* (Poison Oak) after the dry loose skin of the latter has fallen. Winter buds linear-oblong. Shoots of the season often 1 to 2 ft. long.

C. GREENEI C. & E. (not of Greene, Man. 159, as to Napa Co. plants). Leaves similar but rounder; style greenish at the thickened apex; drupe said to be blue, but there is no record of an observation of the fresh fruit; stone globose, not channeled or scarcely ridged.—Type specimens in the Herbarium of the University of California, doubtless Californian but the particular locality unknown.

3. **C. glabrata** Benth. Shrub, 5 to 12 ft. high, with gray bark, and nearly or quite glabrous twigs; leaves narrowly obovate or

oblong, acute at each end, or acuminate at apex, $1\frac{1}{4}$ to $1\frac{3}{4}$ in. long, green on both faces, obscurely pubescent with short scattered appressed hairs; petioles 3 lines long or less; flowers in many small open cymes; ovary canescent; style thickened at apex, slightly pubescent; drupe globose, white; stone little compressed and not furrowed.

Stream-beds; Mt. Diablo; borders of swamps near Searsville and southward in the Coast Ranges to Monterey. May. Annual growth of the branches, in this and in the next, but a few in. or even less than 1 in. in length; very short as compared with no. 2.

4. **C. Torreyi** Wats. Slender shrub, 5 to 8 ft. high; bark brown with numerous lenticles; foliage reddish, at least in the summer and autumn; leaves oblong- or more frequently ovate-lanceolate, $1\frac{1}{4}$ to rather less than 2 in. long; pubescence as in the preceding; drupe over 3 lines long, probably brownish or tan-color; stone globose or scarcely at all compressed, tubercled at apex, distinctly pointed at base.

Wooden Valley, Napa Co. (C. Greenei of Greene, Man. 159, in part); northward into Lake Co. (abundant in Scott Valley, where it forms thickets along the bases of low hills).

74. GARRYACEÆ. SILK-TASSEL FAMILY.

Shrubs or small trees with quadrangular branchlets. Leaves simple, opposite, with short petioles. Flowers diœcious, apetalous, in axillary pendulous aments, solitary or disposed in 3's between the decussately connate bracts. Staminate flower:—calyx 4-parted into linear valvate sepals; stamens 4; filaments distinct. Pistillate flower:—calyx with a shortly 2-lobed or obsolete limb; ovary 1-celled, with 2 pendulous ovules; styles 2, stigmatic on the inner side, persistent. Fruit a berry; juice of the pulp staining rose-purple; epicarp at maturity free from the pulpy portion and either circumscissile or as often dehiscent irregularly. Seeds with thin testa and horny endosperm, the minute embryo at one end. Apparently related in certain particulars to Cupuliferæ and Piperaceæ.

1. GARRYA Dougl.

The only genus. (Named by Douglas, the indefatigable botanical explorer of Pacific North America, in honor of Nicholas Garry, of the Hudson Bay Co., to whom he was indebted for assistance in his travels.)

Leaves undulate-margined; fruit tomentose. 1. *G. elliptica*.

Leaves plane, often yellow-green; fruit at maturity glabrous. 2. *G. Fremonti*.

1. **G. elliptica** Dougl. SILK-TASSEL TREE. Small tree, 8 to 10 ft. high or more, commonly a shrub about 5 ft. high; leaves elliptical or narrower, the margin undulate and more or less revolute, glabrous above, tomentose beneath; aments solitary or clustered, the sterile 4 to 10 in. long with truncate or acute silky bracts and the

calyx-segments cohering at tip; fertile aments shorter, 2 to 4 in. long, with acute or acuminate bracts; ovary sessile; fruit globose, 3 to 4 lines in diameter, densely silky-tomentose like the ovary, in extreme age glabrate; seed oval, 2 lines long.

Common in the Coast Ranges from Monterey Co. northward: Los Gatos; San Mateo Co.; Angel Island; Mt. Tamalpais; Redwood Peak, Oakland Hills. Feb. Fruiting June-Sept.

2. **G. Fremonti** Torr. BEAR BRUSH. Shrub, usually about 5 or becoming 10 ft. high; leaves oblong, tapering to each end, varying to elliptical, glabrous and shining above, gray-puberulent or white-tomentose beneath, in age often glabrous and yellow, particularly on the under surface, not undulate, commonly $1\frac{1}{2}$ (rarely 3) in. long, on petioles 6 lines long; aments solitary or in clusters of 2 to 6, with acute somewhat silky bracts; staminate aments 2 to 3 in. long; pistillate ament about $1\frac{1}{2}$ in. long, the ovary and young fruit very silky; fruiting aments $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; mature fruit glabrous, 3 lines long, short-pediceled; seeds subglobose or oval, $1\frac{1}{2}$ lines long.

High Coast Range ridges and slopes: Yallo Bally Mountains, Jepson; Napa Mountains; Vaca Mountains; southward to Mt. Hamilton, Brewer. Also in the Sierra Nevada. Feb. The bark when broken exudes a black juice.

G. BUXIFOLIA Gray, of Red Mountain, Mendocino Co., has leaves appressed-silky beneath and bears very slender aments.

75. ARISTOLOCHIACEÆ. BIRTHWORT FAMILY.

Perennial herbs or twining shrubs. Leaves simple, alternate, petioled, cordate. Flowers perfect, apetalous, with a petal-like synsepalous 3-lobed calyx. Stamens 6 to 12 with extrorse anthers. Styles mostly 6 and united at base, or 1. Ovary inferior 6-celled. Fruit a fleshy or dry capsule. Seeds in 1 or 2 rows on the inner angle of each cell, with a minute embryo in copious endosperm.

Perennial herb; calyx regular; capsule irregularly dehiscent

1. **ASARUM.**

Woody climber; calyx irregular; capsule septicidally dehiscent

2. **ARISTOLOCHIA.**

1. **ASARUM** L.

Nearly acaulescent herbs, with creeping fragrant rootstocks bearing 2 or 3 scale-like bracts, then 1 or 2 reniform or cordate leaves on long closely approximate petioles and a short-peduncled flower close to the ground in the axil of the lower leaf. Calyx regular, campanulate, the limb 3-parted, the lobes spreading or recurved, persistent. Stamens 12, nearly free from the styles, at first reflexed, the alternate ones shorter; filaments more or less distinct, the connective usually continued beyond the anther into a point. Capsule globose, fleshy, commonly bursting irregularly. Seeds large, thick, in 2 rows in each cell. (Derivation obscure.)

1. **A. caudatum** Lindl. WILD GINGER. Evergreen; rootstocks slender, elongated; leaves cordate-reniform, shortly acute or obtusish,

pubescent below and above on the veins, 3 to 6 in. broad, on petioles $3\frac{1}{2}$ to 7 in. long; peduncles 6 to 12 lines long; calyx-lobes triangular or oblong, attenuate into a tail which is 1 to $2\frac{1}{4}$ in. long; filament stout, the free apex of the connective much shorter than the anther; ovary 4 lines broad; styles united, equaling the stamens; seeds ovate, $1\frac{1}{2}$ lines long.

Not infrequent in deep shade of woods, following very closely the distribution of the Coast Redwood: Santa Cruz Mountains; Oakland Hills, F. P. McLean, 1874, Ralph E. Gibbs, 1898; Marin Co.; Napa Valley and northward. Not in the inner Coast Ranges. Feb.—June. There are two other species in California: *A. HARTWEGI* Wats., common in the Sierra Nevada from Mt. Shasta to Yosemite, has the leaves strikingly mottled and glabrous above; calyx-lobes caudate-attenuate, 1 to $1\frac{1}{2}$ in. long; connective as long or twice as long as the anther. *A. LEMMONI* Gray is very similar to *A. caudatum*, but the leaves are nearly glabrous above and the calyx-lobes are obtuse, or only acute and $\frac{1}{2}$ in. long or less.—Sierra Nevada, Plumas Co., *Lemmon*, to Fresno Co., acc. to Greene.

2. ARISTOLOCHIA L. PIPE VINE.

Twining shrubs with sparingly branched stems and axillary pendulous flowers. Calyx tubular, strongly curved and pipe-shaped, deciduous. Anthers 6, rarely 7 or 8, sessile, and adnate to the short style. Stigma 3 to 6-lobed or -angled. Capsule 6-angled and 6-valved, septicidally dehiscent. Seeds horizontal, in one row in each cell, numerous. (Greek aristos, best, locheia, parturition, from its supposed efficacy in child-birth.)

1. *A. Californica* Torr. DUTCHMAN'S PIPE. Deciduous woody climber, twining 5 to 12 ft. high on shrubs, the herbage more or less pubescent, sometimes silky; leaves conduplicate in the bud, ovate, cordate, $1\frac{1}{2}$ to 3 or even $5\frac{1}{2}$ in. long, on petioles 1 or 2 in. long or less; pedicels $\frac{3}{4}$ in. long, with a bract at the middle; calyx greenish, veined with purple, the tube closely doubled upon itself, forming a very sharp angle on the upper side and conspicuously inflated on the lower side, only slightly contracted at the throat, 4 to 6 lines broad, $1\frac{1}{8}$ to $1\frac{1}{2}$ in. from base to apex on the lower side; inside of tube near the base with a broad dull purple band; limb 2-lipped, the upper lip consisting of 2 broad obtuse lobes, the lower entire, all lined with a disk-like thickening which on the upper side is continued downward and at the angle forms a projection partially closing the tube; anthers disposed in pairs on the lower part of the stigma-lobes; ovary clavate; stigma with 3 broad obtuse lobes; capsule broadly oblong-obovate, abruptly contracted to a slender base, 6-winged, 2 to $2\frac{1}{2}$ in. long; seeds cuneate-obovate, 3 lines long, deeply concave on the upper side, the edges incurved, with a very prominent spongy raphe in the concavity.

Coast Ranges: Monterey northward to Marin Co.; Glen Ellen, *M. Louise Douglas*; Wooden Valley grade from Napa Valley; Araquipa Hills (Solano Co.); and Mendocino Co. Also in the

Sierra Nevada. Widely distributed but nowhere common. Mar.-Apr. Fr. July.

76. LORANTHACEÆ. MISTLETOE FAMILY.

Evergreen shrubs, parasitic on trees. Branches dichotomous. Leaves opposite, simple and entire, or often reduced to connate scales. Flowers diœcious (in ours), greenish and inconspicuous, regular, apetalous. Sepals 2 to 5. Stamens as many as the sepals and inserted upon them; anthers 1 or 2-celled. Ovary inferior, 1-celled. Fruit a berry with glutinous endocarp. Embryo straight, in copious endosperm.

Berry sessile; flowers globose; calyx mostly 3-lobed or -toothed; anthers 2-celled; leaves (in ours) foliaceous 1. PHORADENDRON.
 Berry on recurved pedicels; flowers mostly compressed; staminate calyx 3-lobed; pistillate 2-toothed; anthers 1-celled; leaves scale-like and connate 2. RAZOUMOFSKYA.

1. PHORADENDRON Nutt. MISTLETOE.

Parasitic on mostly deciduous trees, the stems much branched and swollen at the nodes. Leaves foliaceous and coriaceous, or scale-like. Flowers sunk in the joints of the jointed spikes, usually several to each scale. Staminate calyx commonly 3-lobed, the anthers sessile on the base of the lobes. Pistillate calyx adherent to the ovary, the 3 teeth persistent on the globose semitransparent mucilaginous berry. (Greek phor, a thief, and dendron, a tree.)

Leaves elliptic to oblong, 3 or 5-nerved.

Herbage yellowish 1. *P. flavescens*.
 Herbage greenish 2. *P. villosum*.
 Leaves narrowly oblong or spatulate, nerveless 3. *P. Bolleanum*.

1. *P. flavescens* Nutt. YELLOW MISTLETOE. Foliage yellowish green; leaves orbicular to ovate or narrowly elliptic, obtuse, $3\frac{1}{2}$ in. long or less, conspicuously 5-nerved from the base and distinctly petioled; fruiting spikes dense, $1\frac{1}{2}$ in. long or less; berries white, 2 lines in diameter.

Interior of California: Putah Creek, on Cottonwood trees (*Populus Fremonti* Torr.); Pleasant Valley, Solano Co., also on Cottonwoods, many large trees having been killed by the parasite; foothills of the inner Coast Ranges near Vacaville, on Buckeye (*Æsculus Californica*). Fruiting in Jan. This species, as observed on the Buckeye, reproduces vegetatively. The haustoria spread in the bark, and by buds give rise to numerous plants which often impart a very twiggy appearance to the Buckeye branches.

2. *P. villosum* Nutt. COMMON MISTLETOE. Foliage deep green; leaves elliptic, obtuse, 3-nerved, 1 in. long, on short petioles; berries pinkish, $1\frac{1}{2}$ lines in diameter.

Coast Ranges: Solano Co.; Napa Valley; Wild Cat Creek (Contra Costa Co.) and southward. Parasitic on Oaks, especially the Blue Oak (*Quercus Douglasii*), forming globose or bush-like clusters 2 to 3 ft. in diameter. The cluster commonly arises from a single main

stem or trunk attached to the branch of the host. The plant does not reproduce vegetatively, at least in this region.

3. *P. Bolleanum* (Seeman) Eichler. Stems $\frac{1}{2}$ to $\frac{3}{4}$ ft. long; leaves narrowly oblong or spatulate, obtuse, contracted to a short petiole, $\frac{1}{2}$ to 1 in. long; bracts ciliate; spikelets short, mostly less than $\frac{1}{4}$ in. long, opposite or in fours; berries pearl-like on account of their whiteness, translucency, and luster, rather less than 2 lines in diameter.

Northeastern base of Mt. St. Helena, on *Cupressus MacNabiana*, Jepson; Mt. Tamalpais, on *Juniper*, Alice Eastwood; inner Coast Ranges west of Bakersfield, on *Juniper*. Rare in our region. Fruiting in Dec.

2. RAZOUMOFSKYA Hoffm.

Plants yellow or yellowish brown, leafless, fragile-jointed, parasitic on coniferous trees. Stems quadrangular or angled. Leaves represented by connate scales. Flowers solitary or several in each axil, crowded into apparent spikes, opening in autumn. Staminate flower:—calyx mostly 3-parted, compressed; stamens consisting of a single 1-celled roundish anther, opening by a circular slit. Pistillate flower:—calyx 2-cleft, the teeth laterally disposed, the ovary ripening the next autumn after flowering and exerted on the recurved pedicel. Berry circumscissile near the base, when fully ripe explosively dehiscent at a touch or when teased, the glutinous seed being expelled to a distance of several feet. (Count Alexis de Razoumofsky, Russian savant of the early part of the 19th century, who possessed a large botanic garden near Moscow.)

1. *R. occidentalis* (Engelm.) O. Kuntze. PINE MISTLETOE. Stems dichotomously branched, 4 to 15 in. long, the branches bearing numerous spikes, the lower spikes commonly with accessory spikes in the axils; staminate spikes deep yellow, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; staminate flowers exceeding 1 line in breadth; pistillate plants olive-brown; spikes short, 5 or 6-flowered, arranged along the axis of the inflorescence, the upper spikelets mostly reduced to 1 flower, and the inflorescence paniculate; berries brown, oblong, tapering to each end, 2 to 2 $\frac{1}{2}$ lines long.—(*Arceuthobium occidentale* Engelm.)

Common on Digger Pine (*Pinus Sabiniana*) all through the inner Coast Ranges from Mt. Diablo and Putnam's Peak (Vaca Foothills) to Berryessa Valley and Butts' Cañon in northern Napa Co. Also on Yellow Pine (*Pinus ponderosa*) at the head of Conn Valley near St. Helena. Oct.—Jan. The accessory and primary branchlets are anterior and posterior, not side by side. The plant parasitic on *Pinus attenuata*, summit of Mt. St. Helena, Jepson, is referred to *R. Douglasii* (Engelm.) O. Kuntze var. *abietina* (Engelm.) Greene in Greene's Manual.

SYMPETALÆ.

Corolla almost always present, consisting of more or less united petals; stamens inserted upon the corolla except in the first family; stipules in ours none.

77. ERICACEÆ. HEATH FAMILY.

Trees, shrubs, or perennial herbs. Leaves simple, alternate in all our genera except *Chimaphila*, mostly evergreen and stiff and coriaceous. Flowers regular and symmetrical, with the parts in 5's or 4's. Stamens free from the corolla, as many or commonly twice as many as its lobes or petals and always distinct from them; anthers 2-celled, in ours opening by a terminal pore or chink and frequently bearing two horn-like or awn-like appendages. Ovary superior or inferior, 4 to 10 (rarely 2 or 3)-celled, with usually axile placentæ bearing numerous ovules. Corolla in most cases sympetalous, but choripetalous in *Chimaphilla* and *Pyrola*. *Rhodendron* has a slightly irregular corolla. The red or white flowers are pendulous as a rule and the pollen-grains are often united in 4's (tetrads).

The suborder *Monotropeæ* has no representatives within our limits, but several in the state. All have hypogynous flowers and are parasites or saprophytes with red, brown, or dull white herbage:

ALLOTROPA VIRGATA T. & G. Reddish or whitish rather fleshy plant; corolla none; ovary 5-celled, as in the next two.—Northern California.

PTEROSPORA ANDROMEDA Nutt. Pine Drops. Reddish brown plant; flowers racemose; corolla sympetalous; anthers 2-awned at the back.—Sierra Nevada; Lake Co. and northward.

SARCODES SANGUINEA Torr. Snow Plant. Bright red or scarlet plant; flowers in a fleshy scaly spike; corolla sympetalous; anthers not awned.—Sierra Nevada.

PLEURICOSPORA FIMBRIOLATA Gray. Brownish or whitish plant; corolla of 4 or 5 petals; ovary 1-celled.—Southern Sierra Nevada; near Healdsburg acc. to Brandegee.

HEMITOMES CONGESTUM Gray. Spike capitate, often subterranean; sepals 2; corolla tubular-urn-shaped, 4 or 5-lobed; ovary 1-celled, apparently several-celled by the meeting of adjacent placental plates.—Coast Ranges, near the coast.

Corolla choripetalous; fruit a capsule.

Suffrutescent plants.

Flowers 1 to several, corymbose on a leafy stem. . . . 1. *CHIMAPHILA*.

Flowers racemose on a naked or sparingly scaly-bracted scape.

2. *PYROLA*.

Low shrub; flowers numerous in umbel-like corymbs; leaves resinous-dotted below. 3. *LEDUM*.

Corolla sympetalous; trees or shrubs except no. 7.

Calyx-tube free from the ovary.

Corolla funnelform; fruit a capsule. 4. *RHODODENDRON*.

Corolla urn-shaped.

Fruit drupaceous, with stone-like nutlets, and smooth or resinous surface. 5. *ARCTOSTAPHYLOS*.

Fruit a berry, surface granular. 6. *ARBUTUS*.

Fruit enclosed in the enlarged and baccate calyx. . . . 7. *GAULTHERIA*.

Calyx-tube adherent to the ovary; fruit a berry. . . . 8. *VACCINIUM*.

1. *CHIMAPHILA* Pursh. *PIPSISSEWA*.

Low perennial evergreen suffrutescent plants. Leaves scattered or in irregular whorls, serrulate. Flowers white, waxy, in a terminal

naked corymb. Calyx 5-parted. Corolla rotate, choripetalous; petals 5, orbicular, concave. Stamens 10; filaments dilated and hairy in the middle. Stigma orbicular-peltate, crowning the very short style which is concealed in the umbilicate summit of the ovary. Capsule dehiscent from above downwards. (Greek cheima, winter, and phileo, to love, the plants evergreen.)

1. **C. Menziesii** Spreng. MENZIES PIPSISSEWA. More or less branched from the base, 3 or 4 in. high; leaves ovate, 1 in. or rather less in length, sometimes purplish beneath, often mottled or veined with white above; peduncles 1 to 3-flowered; bracts ovate or roundish; flowers 3 lines in diameter; filaments villous on the dilated middle portion.

Pine woods of the Sierra Nevada. Rare in the Coast Ranges: Mendocino Co.; Mt. Hamilton. San Bernardino Mountains.

C. UMBELLATA Nutt. Prince's Pine. Nine to 14 in. high; leaves oblong, $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long, often widest near the apex and tapering gradually to the base, bright green, not variegated; filaments hairy on the margins only.—Mendocino Co. to Mt. Shasta.

2. PYROLA L. WINTERGREEN.

Perennial acaulescent herbs from slender rootstocks, leafless or with radical evergreen leaves. Flowers 5-merous, in a raceme on a naked or sparingly scaly-bracted scape. Corolla choripetalous. Petals concave or incurved, more or less converging. Stamens 10; filaments subulate, naked. Stigma 5-lobed or -toothed, surrounded by a ring. Capsule depressed-globose and 5-lobed, umbilicate at apex and base, dehiscent from the base upward; edges of the valves cobwebby when opening, persistent on the axis. Embryo minute. (Diminutive of *Pirus*, classical name of the Pear Tree, on account of resemblance in the leaves of one species.)

1. **P. aphylla** Smith. Leafless parasite; stems red, often many and clustered, from a scaly-bracted rootstock, 8 to 16 in. high; calyx red, its lobes triangular-ovate, $\frac{1}{4}$ the length of the obovate or elliptic whitish petals; capsule 3 lines broad, its sutures somewhat cobwebby in dehiscence.

Rare in our district: Mt. Tamalpais; Howell Mountain, *Tracy*; Mt. St. Helena; and northward to Mt. Shasta. Also in the Sierra Nevada. The following species have a cluster of radical leaves and (except the last) a long declined and recurved style.

P. PICTA Smith. White-veined Shin-leaf. Leaves ovate or elliptic, very coriaceous, mottled or veined with white; petiole narrowly winged; calyx-lobes broadly ovate; corolla greenish white or brownish.—Pine forests from Mendocino Co. to Mt. Shasta and southward in the Sierra Nevada.

P. ROTUNDIFOLIA L. var. BRACTEATA Gray. Leaves orbicular and comparatively thin, unmottled, on slender unwinged petioles as long as the blade; calyx-lobes triangular-lanceolate; corolla rose-purple.—With the preceding.

P. SECUNDA L. Leaves ovate, thin and greenish; flowers white,

in a one-sided raceme; petals with two tubercles at base inside.—Northern Sierra Nevada.

3. LEDUM L.

Low shrubs with fragrant herbage. Leaves alternate, entire, with revolute margins. Flowers white, small, in terminal umbel-like clusters from large scaly buds. Pedicels slender. Calyx of 5 almost distinct segments, very small. Corolla of 5 obovate and spreading distinct petals. Stamens 5 to 10; anthers opening by terminal pores. Capsule 5-celled, dehiscing from the base upward, many-seeded; placentæ borne on the summit of the axis of the fruit. (Greek Ledon, ancient name of the Cistus.)

1. *L. glandulosum* Nutt. LABRADOR TEA. Evergreen shrub, 3 to 5 ft. high; leaves rather thickly clothing the stems, oblong, acute at each end, mucronate at apex, 1 to 2½ in. long, green and glabrous on both sides, or light colored beneath with a dense close glandular-dotted felt; petals elliptic-ovate, 2½ to 3 lines long; stamens 4 to 10; filaments ciliate toward the base; capsule oval, nearly 2 lines long.

Point Reyes Peninsula, *Brandeggee*, *Davy*, the only recorded station within our limits; Noyo, Mendocino Co. and northward; Sierra Nevada. June.

4. RHODODENDRON L.

Ours shrubs with alternate entire leaves crowded on the flowering branches. Flowers in umbels or corymbs, from terminal buds with thin deciduous scales. Calyx very small. Corolla funnel-form to campanulate, cleft, often somewhat irregular. Stamens 5 or 10; filaments filiform; anthers short, without awns or appendages, the cells opening by a terminal pore. Style filiform; stigma capitate or somewhat lobed. Fruit a septicidal capsule, the valve separating from the columella. (Greek rhodos, rose, and dendron, a tree.)

Deciduous; flowers commonly white; stamens 5 1. *R. occidentale*.
Evergreen; flowers rose-purple; stamens 10 2. *R. Californicum*.

1. *R. occidentale* Gray. WESTERN AZALEA. Shrub, 3 to 8 ft. high; leaves narrowly or broadly obovate, 1 to 4 in. long, ciliate, otherwise nearly glabrous; flower buds terminal, surrounded at base by leaf buds which give rise to the shoots of the season; calyx 5-parted, its lobes oblong or oval; corolla white, 1½ to nearly 2 in. long, or sometimes rose-tinged, 5-cleft, slightly irregular, the upper lobe with a large yellow splotch; tube conspicuously funnel-form, glandular-viscid outside; capsule oblong, ¾ in. long.

Deep cañons of the seaward and middle Coast Ranges, by stream banks: Santa Cruz Mountains; Marin Co., etc. Also in the Sierra Nevada. A handsome shrub in June when in full bloom, the corolla promptly deciduous from the receptacle, but held pendant for a time by the tangle of stamens and style. *R. Sonomense* Greene is a form with rose-colored flowers occurring from Sonoma Valley to Mt. St. Helena.

2. *R. Californicum* Hook. CALIFORNIA ROSE BAY. Erect, 4 to 8 ft. high; leaves coriaceous and evergreen, oblong or elliptic,

green above, rusty or lighter beneath, 3 to 4 in. long; flower buds 1 in. long, the scales ovate; corolla turbinate-campanulate, rose-purple, the upper lobe greenish-dotted within, $1\frac{1}{4}$ in. long; stamens 10, not exserted; ovary densely pubescent with dark red or rusty hairs; capsule nearly or quite glabrous, red, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $2\frac{1}{2}$ lines in diameter.

Pescadero, *H. A. Dutton*; Mt. Tamalpais and northward to Mendocino and Humboldt Cos.

5. **ARCTOSTAPHYLOS** Adans. MANZANITA.

Shrubs with very crooked branches, the bark dark red or chocolate-colored, smooth and polished. Leaves commonly entire, more or less vertical by twisting of the petiole. Flowers white or pink, in short spikes or racemes, disposed in terminal subglobose clusters or panicles, usually 5-merous. Bractlets commonly scaly. Sepals distinct. Corolla urn-shaped. Anthers as in *Arbutus*; filaments thickened above the base and hairy at the middle. Ovary raised on a hypogynous disk, 4 to 10-celled, with solitary ovules in the cells, in fruit forming a drupe or dry berry with several stony nutlets. Nutlets either distinct, irregularly united in 2's or 3's, or sometimes consolidated into a single stone. Surface of the "berry" brown or deep mahogany, smooth or with resinous dots, the pulp between the skin and stones mealy, or in late summer powdery. The flesh of the fruit is somewhat acid and has been used in the rural districts to make a cooling drink. The individuals are very abundant and in the company of *Ceanothus cuneatus* and other shrubs, form the exceedingly extensive brush thickets known as chaparral which impart a marked character to the scenery of the higher Coast Range ridges and mountain summits. (Greek *arktos*, a bear, and *staphule*, a grape; bears feed on the berries of some species.)

Fruit small, 2 lines long or less; leaves less than 1 in. (mostly $\frac{1}{2}$ in.) long, strictly erect 1. *A. nummularia*.

Fruit 3 to $4\frac{1}{2}$ lines long; leaves exceeding 1 in. (mostly $\frac{1}{2}$ to 2 in.) long.

Branchlets commonly bristly; ovary bearded.

Leaves cordate at base 2. *A. Andersoni*.

Leaves oblong-lanceolate to ovate 3. *A. tomentosa*.

Branchlets glabrous or pubescent; ovary glabrous.

Pedicels glabrous.

Leaves light green, glaucescent; calyx equaling or slightly exceeding diameter of corolla 4. *A. manzanita*.

Leaves vivid green, never glaucescent; calyx $\frac{1}{2}$ diameter of corolla 5. *A. Stanfordiana*.

Pedicels glandular-pubescent; leaves glaucous 6. *A. glauca*.

1. ***A. nummularia* Gray.** Strictly erect, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; branchlets pilose-pubescent, the foliage glabrous and shining; leaves orbicular to elliptic-ovate, entire, veiny on the under surface, thickly clothing the branches, 5 to 11 (commonly about 6) lines long, on petioles 1 line long; flowers little exceeding 1 line in length; ovary bearded; fruit oblong, 2 lines long, the nutlets usually 4.

Common on the southern slopes of Mt. Tamalpais; Ben Lomond, Santa Cruz Mts., *Brandegee, Anderson*; flowering at nearly all seasons.

2. **A. Andersoni** Gray. Branchlets with copious straight spreading hairs or bristles and with glandular indument, the foliage glabrous and glaucous; leaves oblong or varying from broadly to narrowly ovate, obtuse or acute, cuspidate, cordate at base or even auriculate, serrulate below the middle, commonly sessile, or sometimes with a short to nearly 3 in. long petiole; secondary peduncles of the panicle rather long; bracts lanceolate; fruit viscid-pubescent.

Summit of the Oakland Hills and in the Santa Cruz Mountains near the Big Trees, *Anderson*. Variable in its characters, some specimens showing entire leaves without the cordate base.

3. **A. tomentosa** Dougl. Branching shrub, 4 to 8 ft. high; branchlets usually with a glandular indument and spreading bristly hairs; leaves with a fine close tomentum or glabrous, narrowly or broadly oblong to ovate, from obtuse to subcordate at base, acute or obtuse at apex, entire or rarely spinulose-serrulate, 1 to 2 in. long, on very short petioles; bracts linear-lanceolate, the lower foliaceous; filaments pilose-pubescent; ovary hirsute; nutlets separable or more or less united.

Coast Ranges toward the coast. The most common species after *A. Manzanita*, and usually distinguishable from it by the conspicuous foliaceous bracts.

4. **A. Manzanita** Parry. COMMON MANZANITA. Shrubby to sub-arborescent, 4 to 12 ft. high, commonly widely branched from the base with long straggling crooked branches; young twigs and peduncles finely puberulent; pedicels glabrous; leaves elliptic and obtuse at base and apex, the larger orbicular, the smaller oblong and often tapering from the middle to the acute base and apex, 1 to 2 in. long, ostensibly glabrous; inflorescence paniculate, the panicle as broad or broader than high, pendulous on the short abruptly recurved peduncles; flowers commonly white, or tinged with pink; bracts small and dry; calyx closely appressed to the base of the corolla and as broad; corolla broadly urn-shaped; stamens with a hairy tuft on back of filaments at expanded portion; ovary glabrous; fruit smooth, dull white in early summer, becoming deep reddish brown in late summer and fall; nutlets irregularly coalescent, usually 2 or 3 consolidated (indicated by the number of cells) with intermediate (1-celled) ones.

Beginning to flower in Nov. or Dec. and continuing more or less through the winter. Gregarious and covering large areas of the high dry Coast Range slopes, in such cases remarkably uniform in height, about 4 to 6 ft. high. Less crowded in the foothills, where arborescent individuals 12 to 18 ft. high are often found.

5. **A. Stanfordiana** Parry. MYACOMA MANZANITA. An erect, not widely branched shrub, 3 to 5 ft. high, with very slender dark red stems, perfectly glabrous in all its parts; leaves bright green on both faces, narrowly ovate to oblanceolate, most frequently acute at both ends, petioled, 1 to 1½ in. long, very erect; flowers abundant, in elongated racemes, forming an open panicle, light pink to lilac; corolla seldom over 3 lines long, very frequently with an

obscure constriction just below the middle; calyx reddish, only half the diameter of the corolla, somewhat impressed as it were within the truncate or subcordate base of the latter and thus partly concealed; ovary glabrous; nutlets broader than high, usually two or more coherent, rarely all united into a single irregular stone.

Known only from the Mayacamas Range: common on the volcanic rock summit of Mt. St. Helena; exclusively occupying a large part of the denuded La Jota Plateau near La Jota Falls, Howell Mt. Feb.-May. Very trim and like a well-kept shrub, recognizable even by its bright green leaves which are commonly erect, while those of *A. Manzanita* are far less so.

6. *A. glauca* Lindl. Shrubby or almost arborescent, 9 to 25 ft. high, with a trunk often 1 ft. in diameter; foliage glabrous and glaucous; leaves elliptical to broadly ovate or oblong, entire, acute or obtuse at apex, obtuse, truncate or even subcordate at base, $1\frac{1}{4}$ to 2 in. long; petioles 3 to 4 lines long; panicle broader than high, frequently very compact; pedicels glandular-pubescent; flowers white, rather large; fruit usually viscid, pulp scanty; nutlets completely consolidated into a solid smooth stone.

Common in the Mt. Diablo range and southward: Los Gatos, *Brandegee*, *Parry*. Apparently on Caux's Knob west of St. Helena. The leaves of the sterile shoots are sometimes sharply serrate all around.

6. ARBUTUS L.

Our species a tree or large shrub. Leaves evergreen, coriaceous and glossy. Bracts and bractlets scaly. Flowers white. Calyx small, 5-parted, free from the ovary. Corolla globular or ovate. Stamens twice as many as the corolla-lobes, included; anthers with a pair of reflexed awns on the back, each cell opening at the apex anteriorly by a pore. Ovary on a hypogynous disk, 5 or rarely 4-celled; ovules crowded on a fleshy placenta which projects from the inner angle of each cell. Fruit a many-seeded berry with granular surface. (Classical name of the Arbuté tree, under which, says Horace, idle men delight to lie.)

1. *A. Menziesii* Hook. MADROÑA. Commonly 15 to 25 ft. high, the trunk 9 to 18 in. in diameter, with a deep red bark; leaves glabrous, elliptic or ovatis, green above, glaucous beneath, 2 to 5 in. long, on petioles $\frac{1}{2}$ in. long; flowers in an ample terminal panicle of dense racemes; berries fleshy, but rather dry, vermilion or poppy-red, or orange-color when not fully ripe, somewhat depressed-globose, 4 to 5 lines in diameter.

A handsome tree, Bret Harte's "Robin Hood of the Western Wood," well known in the Sierra Foothills and very common in the Coast Ranges, especially northward, where fine specimens 60 ft. high are found. It is rare in the inner North Coast Ranges, only few isolated individuals being known in the mountains of western Solano Co. Large trees are seldom as symmetrical as small ones and usually have the trunk much enlarged at the ground. The bark, which is of

some shade of deep red, exfoliates, revealing beneath a ground of satiny green. This is, however, but an ephemeral color and rapidly changes to light yellow, and finally ages to the characteristic salmon-color, buff, deep red or scarlet. Flowering in Apr.; fruit ripe in Nov.

7. GAULTHERIA L.

Ours low suffrutescent evergreen plants with spicy-aromatic leaves. Calyx 5-cleft with imbricated lobes. Corolla ovate-urn-shaped to campanulate. Stamens 10, filaments dilated below. Stigma entire. Capsule loculicidal, 5-celled, deeply umbilicate, with ascending placenta, enclosed by the enlarged and fleshy calyx. (Dr. Gaultier, Canadian physician and botanist.)

1. **G. Shallon** Pursh. **SALAL**. Stems erect or ascending, 1 to 2 ft. high; leaves ovate or orbicular, slightly cordate, finely serrate, 2 to 4 in. long; petioles 1 line long; racemes axillary or terminal, glandular-viscid, 3 to 6 in. long; bracts scaly, ovate, concave, often reddish; pedicels declined and bracteolate below the middle; corolla 4 lines long, the narrow orifice 5-toothed; anthers with a pair of awn-like appendages on the summit of each cell; fruit purple, becoming black.

Redwood region from Monterey to Marin Co. and northward; sometimes abundant and covering the ground thickly. June-July.

8. VACCINIUM L.

Shrubs. Calyx-tube adnate to the ovary, the limb appearing as teeth. Corolla urn-shaped to campanulate, sympetalous, slightly dentate. Stamens 8 to 10, with hairy or ciliate filaments. Anthers erect, introrse, not awned on the back except in some species, the cells prolonged at the apex into horn-like appendages where they open by a pore or chink. Ovary 4 or 5-celled. Fruit a berry crowned with the vestiges of the calyx-teeth; cells several- to many-seeded. (Classical Latin name of the Bilberry.)

Anthers without awns; flowers crowded in clusters; leaves persistent, serrate

Anthers 2-awned on back; flowers solitary; leaves deciduous, entire or nearly so 1. *V. ovatum*.
 2. *V. parvifolium*.

1. **V. ovatum** Pursh. **HUCKLEBERRY**. Erect evergreen shrub, 4 to 5 ft. high; leaves coriaceous, shining above, oblong-ovate, serrate, short-petioled, persisting 4 or 5 years; flowers axillary and terminal, in crowded clusters; corolla campanulate, pink; stamens 10; ovary 5-celled; berries dark purple, without bloom.

Very common on north slopes of hills, especially in the Redwood Region: Monterey Co.; Oakland Hills, and northward to Oregon. Mar.-Apr. "Berries preserved and canned around Cazadero and Fort Ross; have a very agreeable flavor and are much prized," *Davy*.

2. **V. parvifolium** Smith. **BILBERRY**. Branching glabrous shrub 2 to 4 or 8 ft. high; branchlets conspicuously angled; leaves oblong to oval, obtuse at both ends, entire or nearly so, $\frac{1}{3}$ to $\frac{3}{4}$ in. long, almost

sessile; flowers solitary in the axils, on recurved pedicels; berries light red.

Redwood region from the Santa Cruz Mountains, *Osterhout, Dutton*, to Mendocino Co. and northward. *V. MYRTILLUS* L. var. *MICROPHYLLUM* Hook. of the High Sierras is but 3 to 6 in. high, with leaves 2 to 4 lines long. *V. OCCIDENTALE* Gray of the Sierras has leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. long and a blue berry with a bloom.

78. PRIMULACEÆ. PRIMROSE FAMILY.

Herbs with simple undivided leaves. Flowers perfect, regular and symmetrical, 4 to 8-merous, commonly 5-merous, either axillary or in terminal racemes or umbels. Stamens opposite the lobes of the corolla and inserted on its tube or base. Ovary 1-celled, with a single style and stigma, superior, except in *Samolus*, where it is attached to the base of the calyx; ovules on a free central placenta. Fruit a capsule.

Ovary adnate to base of calyx; marsh plant. 1. *SAMOLUS*.
Ovary free from calyx.

Corolla none; calyx corolla-like; leaves opposite 2. *GLAUX*.
Corolla present.

Leaves opposite or sometimes ternate 3. *ANAGALLIS*.

Leaves in a terminal whorl 4. *TRIENTALIS*.

Leaves all radical; flowers in umbels borne on naked scapes.

Corolla inconspicuous, salverform; stamens included 5. *ANDROSACE*.

Corolla large, with reflexed lobes; stamens exserted. 6. *DODECATHEON*.

1. *SAMOLUS* L. BROOKWEED.

Low and glabrous caulescent herbs with alternate leaves. Flowers small, white, 5-merous, in terminal racemes. Calyx adherent to the base of the ovary, campanulate. Corolla nearly campanulate. Stamens 5, borne on the tube of the corolla, their filaments short; a second series of stamens represented by 5 sterile filaments or staminodia inserted in the sinuses of the corolla and alternating with the anther-bearing stamens. Capsule opening at the apex by 5 valves. (Celtic name.)

1. *S. Valerandi* L. var. *Americanus* Gray. Annual or perennial; stem commonly solitary, erect, simple or branching above into 2 or 3 racemes, or paniculate, 7 in. high; radical leaves rosette-like, round-obovate to oblong-spatulate, obtuse or almost truncate, narrowed toward the base into a broad short petiole, $1\frac{1}{2}$ in. long; cauline leaves similar, the uppermost varying to elliptic, $\frac{1}{4}$ in. long or more; pedicels slender, bractless, but bearing minute bractlets at their middle; calyx-teeth short, broadly triangular; petals very small, white.

Brooks and marshes, rare within our limits: Suisun Marshes, *Davy*; Antioch, *Mrs. K. Brandegee*; San Bernardino, *Parish*.

2. *GLAUX* L.

Somewhat succulent perennial with opposite leaves, distinguished

from all other genera of the order by the absence of a corolla. Calyx purplish or white, campanulate, 5-lobed, assuming the appearance of a corolla, the stamens alternating with its lobes. Capsule 5-valved at apex. Seeds few, immersed in the tissue of the placenta. (From the Greek *glaukos*, sea-green.)

1. **G. maritima** L. SEA MILKWORT. Herbage somewhat succulent; running rootstocks slender; stems 8 to 11 in. high, erect, or ascending from a decumbent base, simple or eventually branching; leaves oblong, 4 to 7 lines long; flowers less than 2 lines long, solitary in the axils, almost sessile; calyx-segments elliptic; capsule globose, a little over 1 line long.

Marshy shores of San Francisco and Suisun Bays. June.

3. **ANAGALLIS** L. PIMPERNEL.

Low herbs with opposite or sometimes ternate entire leaves. Flowers axillary, on slender pedicels. Calyx deeply 5-cleft into narrow segments. Corolla rotate, deeply 5-parted, the rounded lobes convolute in the bud. Stamens 5, inserted on the base of the corolla; filaments hirsute or pubescent. Capsule circumscissile. (Greek, meaning delightful.)

1. **A. arvensis** L. POOR MAN'S WEATHER-GLASS. Stems 1 ft. long, procumbent or ascending; leaves deltoid-ovate, acute, sessile, 4 lines long, shorter than the pedicels; sepals lanceolate, acuminate, scarious-margined toward the base, nearly distinct; corolla vermilion, rotate, 4 to 5 lines broad, the petals lightly joined at base, minutely glandular-ciliate at apex; capsules on recurved pedicels; seeds $\frac{1}{2}$ line long, triangular, the surface pitted.

Crescent City to Southern California, mostly near the coast: common about San Francisco Bay (Berkeley, Napa Valley, etc.). Naturalized.

4. **TRIENTALIS** L.

Low and glabrous perennials. Rootstocks sometimes stoloniferous, tuberous. Stem simple, bearing scales or small leaves below and a whorl of large leaves above, from the center of which the filiform peduncles arise. Flowers commonly 7 (5 or 6)-merous. Corolla rotate, deeply parted. Filaments long and filiform, united at base into a very short ring. Style filiform. Capsule valves 5, revolute. (Latin *trientalis*, containing one-third of a foot, in allusion to the height of the plants.)

1. **T. Europæa** L. var. *latifolia* Torr. STAR-FLOWER. Stems 4 to 6 in. high, from tubers $\frac{1}{3}$ to nearly 1 in. long; leaves of the involucrel whorl 5 or 6, 1 to 2 in. long, broadly obovate, abruptly acute, drawn down to a very short petiole; peduncle $\frac{3}{4}$ to 2 in. long; corolla white or rose-red, about 4 lines broad, its divisions abruptly acuminate and prolonged into a slender point; calyx-lobes narrowly linear-lanceolate, mucronate, exceeding the capsule.

Coast Range woods: Monterey Co.; Santa Cruz; Crystal Springs; Berkeley; Marin Co.; western Napa Co.; Healdsburg; Mendocino

Co. and northward. Also in the Sierra Nevada: Mokelumne Hill; Butte Co. May to first part of June.

5. ANDROSACE L.

Small montane or alpine herbs, with rosulate radical leaves and few to several scapes bearing an involucrate umbel of small white or pink-tinted flowers. Calyx-lobes 5. Corolla somewhat salverform, its lobes 5 (or 4), its tube shorter than the calyx, its throat constricted; stamens short and inserted low down upon the tube. Style mostly short. Capsule subglobose, dehiscent by valves. Seeds few or many. (Androsakes, Greek name of a now unknown sea-plant.)

1. **A. septentrionalis** L. Annual, erect, $1\frac{1}{2}$ to 3 in. high; leaves of the radical tuft linear to lanceolate, rarely oblong, entire or obscurely toothed, 3 or 4 lines long; scapes erect, 1 to 3; inflorescence umbellate; involucre bracts ovate or lanceolate, occasionally very broad at base; pedicels filiform, unequal, $\frac{1}{4}$ to $\frac{1}{2}$ in. long; corolla not exceeding the calyx-lobes, 1 line long; calyx-lobes mostly shorter than its tube, subulate-lanceolate.

Summit of Mt. Diablo, Apr. 10, 1878, *Lemmon*; Berkeley Hills, *J. P. Tracy*, Apr., 1900. *Greene's A. acuta* is doubtless the equivalent of this.

6. DODECATHEON L. SHOOTING STAR.

Low perennial herbs of late spring, with radical leaves and a naked scape bearing an umbel of few or many flowers. Corolla 5-parted, with very short tube and dilated thickened throat, the long and narrow divisions reflexed in flower (as also the calyx-lobes). Stamens on the throat of the corolla; filaments short and flat, monadelphous, but at length separable above. Style filiform, exserted. Fruit a capsule with columnar placenta, surrounded at base by the now erect calyx. (Greek dodeka, 12, and theos, god, the Primrose being under the care of the deities. Singularly handsome flowers similar to those of the cultivated Cyclamen. An American genus of 19 species according to some authors; by others regarded as consisting of a single polymorphic species. For our region we think it expedient to recognize those given below.)

Flowers rose-purple; plants commonly 6 to 12 in. high. . . . 1. *D. Hendersoni*.
Flowers white or cream color; plants 3 to 4 in. high. . . . 2. *D. patulum*.

1. **D. Hendersoni** Gray. MOSQUITO BILLS. SAILORS CAPS. Scapes red or reddish, 9 to 14 in. high, from a strong cluster of fleshy-fibrous roots; leaves elliptic, often widest below the middle, the margin more or less crisped, 1 to $1\frac{3}{4}$ in. long, on petioles about as long; umbels 3 to 13-flowered, the pedicels $3\frac{1}{2}$ in. long or less; flowers 5, rarely 4-merous; calyx cleft into ovate-lanceolate lobes; petals purple with a transverse yellow band at base, which is edged above by white and bounded below by a black-purple area, oblong, 7 lines long; filaments black-purple; anthers clavate, 2 lines long; capsule oblong, circumsissile well below the summit.

Very common on low slopes of the hills and ascending to the higher Coast Range ridges: Santa Clara Co.; Oakland Hills; Solano Co.; Napa Valley; Ukiah, and northward into Oregon. Also in the Sierra Nevada at lower altitudes. Feb.-Apr. The very short perennial caudex produces elongated fleshy bulblets which are borne on the sides, often in great quantity; these are cast off in the autumn and in the next season give rise to a single leaf. Mr. Carl Purdy informs us that these individuals probably do not flower until two more seasons have passed. The bulblets are white and suggestive of the "rice-grain" bulblets of the Rice-root Lily (*Fritillaria mutica*).

2. *D. patulum* Greene. SHOOTING STAR. Similar to the preceding but very low, only 3 or 4 in. high and the roots much more rigid; corolla white, pale cream-color or rarely pinkish; anthers 1 line long; capsule short-oblong or subglobose, circumscissile near the summit.

Subsaline plains of the Lower Sacramento Valley (Vanden Station, eastward to Main Prairie) and southward to the Livermore Valley. Mar. The var. GRACILE Greene, from Loma Prieta, has narrower leaves and "elegantly twisted" petals. The purple-flowered var. BERNALIUM Greene, from Bernal Heights, San Francisco, is in all likelihood one of the intermediate forms between this and the preceding species, as also the whitish-flowered plants of the Oakland Hills.

PRIMULA SUFFRUTESCENS Gray. Sierra Primrose. General habit of Dodecatheon; leaves thickly crowded on creeping stems, cuneate-spatulate, toothed at apex; scape 2 to 4 in. long, bearing an umbel of several flowers; corolla red, its tube surpassing the calyx, its limb $\frac{1}{2}$ in. broad with spreading emarginate or orbiculate lobes.—Crevices of rocks, High Sierras.

79. PLUMBAGINACEÆ. THRIFT FAMILY.

Maritime acaulescent herbs with commonly hard or coriaceous stems and leaves. Flowers regular, perfect, 5-merous throughout. Calyx tubular or funnelform, plaited. Petals with long claws barely united into a ring at base. Stamens opposite the petals, adnate to the base of the claw. Ovary superior, 5-angled at summit, containing a single ovule which hangs from an elongated funiculus arising from the base of the cell. Fruit a utricle or achene, borne in the base of the persistent calyx. Seed with endosperm; embryo straight.

Leaves narrowly linear; inflorescence head-like 1. ARMERIA.
Leaves broad; inflorescence paniculate 2. STATICE.

1. ARMERIA Willd. THRIFT.

Acaulescent perennials with a close tuft of narrowly linear sedge-like leaves. Scape naked, terminating in a globose head of flowers. Heads composed of numerous crowded clusters, each cluster subtended by a scarious bract, the outer bracts forming an involucre, the two outermost united and forming a reversed sheath to the summit of the scape. Flowers in a cluster pediceled or subsessile, subtended by bractlets. Calyx scarious, funnelform. Corolla of 5 apparently dis-

tinct long-clawed petals, each with a stamen on its base. Styles fili-form, united at the very base. (Latin name of a Pink, transferred to Thrift.)

1. **A. vulgaris** Willd. SEA PINK. Leaves flat or revolute-channeled; scapes 9 to 18 in. high, few or solitary; flowers dull pink or flesh-color; calyx-tube 10-nerved, the nerves densely hispid; limb of the calyx more or less erose.—(Statice Armeria L.)

Common on sandy beaches or fields near the sea along the California coast or about San Francisco Bay. May–June.

2. STATICE L. MARSH ROSEMARY.

Leaves broad, fleshy, in a radical tuft. Flowers secund, in short spikes or clusters terminating the many branchlets of a branching scape. Calyx hairy on the angles below. Styles wholly distinct. (Greek statike, astringent.)

1. **S. Limonium** L. var. **Californica** Gray. Root $\frac{1}{2}$ to 1 in. thick, reddish, woody; leaves obovate- to oblong-spatulate, obtuse or sometimes retuse, tapering below into a rather long petiole, 4 to 9 in. long; scapes 1 to 2 ft. high, loosely paniculate; flowers lavender-color.

Common about San Francisco Bay and along the coast. July–Dec.

80. GENTIANACEÆ. GENTIAN FAMILY.

Glabrous herbs with a colorless bitter juice. Leaves opposite, simple in ours, entire. Flowers perfect, regular 5 or 4-merous. Calyx persistent. Corolla usually withering-persistent. Stamens on the tube or throat of the corolla, the lobes of which are commonly convolute. Ovary 1-celled, with 2 parietal placentæ. Fruit a 2-valved septicidal capsule, the incurved edges bearing the seeds.

MENYANTHES TRIFOLIATA L., Buck-bean, is an aquatic or marsh plant of the Sierra Nevada, with alternate compound leaves and white or pink flowers in a raceme; it was found near San Francisco in early days by Bigelow and by Behr, but has since become extinct. The genus **FRASERA** includes perennials with small rotate 4-parted corolla and flattened capsule. **F. NITIDA**, of the Sierra Foothills northward, has been found on Mt. Hanna of the Coast Ranges, *Jepson*, July, 1897; it has a pale bluish corolla with a single greenish gland on each lobe. **F. SPECIOSA** Dougl., of the Sierra Nevada, has 2 glands on each corolla-lobe with a separate crown below them.

Perennials; flowers blue; anthers remaining straight . . . 1. **GENTIANA**.
Annuals.

Flowers red or pink; anthers twisting spirally after shedding pollen . . .
2. **ERYTHRÆA**.

Flowers yellow; anthers unchanged . . . 3. **MICROCALA**.

1. GENTIANA L. GENTIAN.

Herbs with opposite sessile leaves and showy usually blue flowers. Corolla withering-persistent and enclosing the capsule. Calyx 4 or 5-cleft, commonly with a membranous or spathe-like tube. Corolla

campanulate or funnelform, the lobes 4 or 5 and often with teeth or plaited folds in their sinuses. Style short and persistent, or none; stigmas 2. Capsule oblong, containing very numerous small seeds with a loose cellular or winged coat. (Named for Gentius, king of Illyria, who discovered the tonic properties of these herbs.)

1. **G. Oregana** Engelm. Perennial, erect, $1\frac{1}{4}$ to 2 ft. high; leaves ovate or oblong-ovate, 1 to $1\frac{1}{2}$ in. long; flowers few to several at summit of stem; bracts oblong or ovate; calyx-lobes oblong-to ovate-lanceolate, as long as tube; corolla broadly funnelform, almost always 5-merous, $1\frac{1}{4}$ to $1\frac{3}{8}$ in. long, the lobes ovate, not narrowed at base; plaits in the sinuses prolonged into conspicuous subulate appendages; capsule more or less stipitate; seed surrounded by a distinct wing.

North Coast ranges, rare within our limits: Mt. Tamalpais; Point Reyes; Point Arena and northward. There are at least five other species of Gentian in the Sierra Nevada, mostly alpine or subalpine.

2. **ERYTHRÆA** Renealm. CANCHALAGUA.

Low erect leafy annuals, mostly freely branching. Flowers red or pink, 5 or sometimes 4-merous, in cymes or cymosely paniculate. Calyx-lobes narrow, carinate. Corolla salverform, the stamens inserted on its throat. Filaments slender, the anthers oblong or linear, twisting spirally after shedding their pollen and commonly exerted. Style filiform, deciduous; stigmas oblong to fan-shaped. Capsule oblong-ovate to fusiform, 1-celled, but the seed-bearing edges of the valves more or less approximate in the center. Seeds oblong or spherical, reticulate-pitted. (Greek *eruthros*, red, the flowers commonly of that color.)

Anthers oblong; corolla-lobes $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long 1. *E. Muhlenbergii*.
Anthers linear; corolla-lobes $3\frac{3}{4}$ to 4 lines long 2. *E. trichantha*.

1. **E. Muhlenbergii** Griseb. Two or 3 to 9 in. high; leaves oblong, the floral lanceolate; inflorescence sparsely paniculate; flowers in the forks with short pedicels or hardly any; lateral flowers with pedicels often as long as the flower and with 2 bractlets at summit; corolla-lobes oval, obtuse or retuse, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; anthers oblong; seeds short-oval.

Rather common in the Bay Region.

2. **E. trichantha** Griseb. Nine in. high or less; leaves narrowly ovate to oblong-lanceolate, $1\frac{1}{2}$ in. long or less, inflorescence densely cymose; corolla-lobes $3\frac{1}{4}$ to 4 lines long, very much shorter than the tube, oblong, acute at apex but at length involute and therefore seeming acuminate; anthers linear; stigmas small.

Coast Range valleys at Calistoga and elsewhere.

3. **MICROCALA** Hoffmgg. & Link.

Almost minute annual. Stem simple, or with peduncle-like branches terminating in a 4-merous yellow flower. Calyx 4-toothed. Corolla short-salverform, the 4 short stamens inserted on its throat.

Anthers cordate-ovate and unchanged after anthesis. Stigma of 2 fan-shaped lobes which at length separate. (Greek mikros, small, and kalos, beautiful.)

1. **M. quadrangularis** (Lam.) Griseb. Commonly 1 to 2 in. high, with 1 to 3 pairs of oval or oblong leaves below, these $1\frac{1}{2}$ to 3 lines long; peduncle naked, quadrangular; calyx short, strongly quadrangular, and seeming as if truncate at base and apex, especially in fruit, when it is 2 to $2\frac{1}{2}$ lines long; corolla deep yellow, the lower half membranaceous, twice as long as the calyx, open under a sunny sky, closing in afternoon.

Level or moist country in the neighborhood of low hills, or in open woods, mostly of the outer Coast Ranges: "Noyo and Mendocino Plains," Bolander, no. 4726; Santa Rosa; Sonoma; Martinez and Vallejo acc. to Bot. Cal.; Mt. Tamalpais; San Rafael; Berkeley; Oakland; San Francisco. Thought by some not to be a native plant.

81. APOCYNACEÆ. DOGBANE FAMILY.

Ours herbs with milky juice. Leaves simple, entire and opposite. Flowers complete, regular, 5-merous except the pistils which are 2. Calyx nearly free from the ovaries, imbricated in the bud and persistent. Corolla-lobes convolute in the bud. Stamens borne on the corolla; anthers produced at base into a sterile appendage, connivent around the stigma, alternate with its lobes. Ovaries 2 and distinct (though their styles and stigmas are united into one), both developing into follicles. Seeds in ours with a silky tuft of hairs at the end (coma); embryo large, straight, in scanty albumen. An order closely allied to the milkweeds.

VINCA MAJOR L., Common Periwinkle, is found as an escape near gardens, particularly along stream banks; it is known in California chiefly under the erroneous name of "Myrtle."

Calyx-tube adnate to back of ovaries below; style very short. 1. APOCYNUM. Calyx wholly free; style long and filiform. 2. CYCLADENIA.

1. APOCYNUM L. INDIAN HEMP.

Flowers small in terminal cymes. Calyx small, deeply 5-cleft, its tube by means of a disk adnate to the back of the ovaries below. Corolla campanulate, 5-lobed, bearing 5 small triangular-subulate appendages alternate with the stamens. Stamens borne at base of corolla; filaments short and broad; anthers sagittate, acute. Style very short or hardly any; stigma ovoid, obscurely 2-lobed. Follicles 2 to 7 in. long, slender, pointed, terete. Seeds numerous, flattish. (Greek apo, from, and kuon, dog, ancient name of the Dogbane.)

Low pubescent herb; corolla pinkish white. 1. *A. androsæmifolium*. Tall glabrous yellowish green herb; corolla greenish. 2. *A. cannabinum*.

1. **A. androsæmifolium** L. var. **pumilum** Gray. Diffusely branched, 7 to 12 in. high; herbage finely pubescent; leaves ovate to oval, or some lowermost orbicular, varying from obtuse to cordate at

base, $\frac{3}{4}$ to 1 in. long, on short petioles; flowers solitary in the upper axils, and in short cymose clusters at the ends of the branches; corolla pinkish white, subcylindric, 2 lines long or over, its lobes broadly oblong, its tube much exceeding the lanceolate calyx-lobes.—(*A. pumilum* Greene.)

Mt. Diablo; base of low hills east of St. Helena; northward to Mt. Shasta. June. The species apparently occurs northward beyond our limits.

2. *A. cannabinum* L. COMMON INDIAN HEMP. Stems erect, 2 to 4 ft. high, rather strict; herbage of a light almost yellowish green, glabrous; leaves oblong-ovate or lanceolate, or the lower oval, ovate, or oblong, sessile or short-petioled; flowers small, in dense terminal cymes; corolla greenish, $1\frac{1}{2}$ lines long or less, its segments not surpassing the calyx-lobes.

Along stream and river-banks almost everywhere, more common in the interior: Ukiah; Sacramento and San Joaquin Rivers; Amador Co.; Yosemite Valley; Southern California. May–July.

A. vestitum Greene of “hills west of Napa Valley, in dry soil,” said to be allied to this, is described as dwarfish, densely soft-pubescent throughout, with all the leaves ovate-lanceolate and 1 to 2 in. long.

2. CYCLADENIA Benth.

Low perennials. Stems simple, several to many from a large fleshy root, bearing 2 or 3 pairs of leaves and 2 or 3 axillary peduncles with 2 or 3 rose-purple flowers on slender pedicels. Calyx parted into 5 slender lobes. Corolla funnelform with 5 broadly oblong or roundish lobes and 5 minute appendages alternate with the lobes, one behind each stamen. Stamens borne on the tube. Style long and filiform, with a conspicuous membranous ring under the stigma. Disk an entire cup surrounding the base of the ovaries. (Greek kuklos, a ring, and aden, a gland, referring to the disk.)

1. *C. humilis* Benth. Three to 6 in. high, glabrous; leaves thickish, ovate or roundish, petioled, $1\frac{1}{4}$ to $2\frac{1}{2}$ in. long; corolla about $\frac{3}{4}$ in. long; pedicels about 7 lines long; follicles 3 in. long.

Mountains of California at about 6,000 ft. altitude: Snow Mt., Lake Co., *Brandegee*; Bally Mt. (between Redding and Weaverville), *Brewer*, no. 1448; Silver Lake, Lassen Co., *Baker*; Medicine Lake, Siskiyou Co., *Baker*; San Antonio Mountains, *Hall*; first collected by Hartweg, in 1847, doubtless near Bear Valley, Nevada Co.

82. ASCLEPIADACEÆ. MILKWEED FAMILY.

Herbs with milky juice. Leaves opposite or whorled. Flowers regular, with the stamens and the divisions of the corolla and calyx 5. Pistils 2, with distinct superior ovaries; styles distinct below but united above into a short-cylindric styler disk, and surrounded by the stamens which are attached to it. Between each anther, on the sides of the styler organ, is a cloven gland or elevated ridge slit longitudi-

nally. Pollen-grains in each cell united into waxy pear-shaped masses which are stalked and suspended in pairs from the summit of the slits, each pair of stalks deriving its pollen-masses, not from the cells of one anther, but from contiguous anther-cells of different anthers. Pollination strictly entomophilous; the foot of the insect is caught in the slit, and when drawn upward, drags out and bears away the pollen-masses; in walking over other flowers, the insect's foot is again drawn through a slit, and the pollen-masses are left behind on the stigma, which is concealed beneath the cloven structure. Inflorescence cymose. Fruit consisting of 2 follicles. Seeds with a silky tuft of hairs at the micropyle.

Stems terete, erect. 1. ASCLEPIAS.
Stems strongly flattened, prostrate. 2. SOLANOÆ.

1. ASCLEPIAS L. MILKWEED.

Perennial herbs with thick deep-seated roots. Stems strictly erect. Peduncles of the simple umbels generally placed between the opposite leaves, but nearer one than the other. Bracts of the involucre usually subulate. Calyx and corolla 5-parted, the divisions reflexed, those of the former small, persistent, those of the latter deciduous. Stamens 5, inserted on the base of the corolla, the filaments united into a tube which is blended above with the stylar column and bears a circle of 5 hoods, each containing an incurved horn, or hornless. Follicles ovate or lanceolate, one often abortive. Seeds anatropous, flat, margined, imbricated on the large placenta. Embryo large, with broad foliaceous cotyledons in thin albumen. (Greek name of the European Swallow-wort, a plant of this family.)

Hoods of the stamens with an incurved horn or crest projecting from or contained within the cavity.

Herbage glabrous; leaves mostly in whorls of 3 to 6, linear or linear-lanceolate; umbels on peduncles longer than the pedicels.

1. *A. Mexicana*.

Herbage hoary-tomentose; leaves broad.

Umbels on peduncles longer than the pedicels.

Hoods twice as long as the stamen-column; corolla purplish; leaves opposite. 2. *A. speciosa*.

Hoods not exceeding the column; corolla creamy-white; some of the leaves in whorls of 3 or 4. 3. *A. eriocarpa*.

Lateral umbels sessile, the terminal one peduncled; hoods not exceeding the column; leaves all opposite. 4. *A. vestita*.

No horns to the hoods of the stamens.

Hoods conical, open down the front, a little exceeding the anthers; herbage glabrous, greenish or purplish. 5. *A. cordifolia*.

Hoods pointless, lower than the anthers, cleft half-way down the back; herbage white-tomentose. 6. *A. Californica*.

1. *A. Mexicana* Cav. Stems slender, about 2 ft. high; herbage glabrous; leaves in whorls of 3 to 6, or the lower and uppermost opposite; leaves linear to linear-lanceolate, $2\frac{1}{2}$ to 6 in. long, 2 to 6 lines broad, short-petioled; umbels many, often in whorls or corymbose, densely many-flowered, on peduncles longer than the pedicels; flowers small, greenish white or tinged with purple; corolla-lobes oblong, 2 lines long; horns slender, subulate, exserted from the hood

and incurved over the summit of the disk; follicles 3 or 4 in. long, about 4 lines in diameter at the widest part; seeds $3\frac{1}{2}$ lines long.

Forming patches in dry ground; distributed throughout California, but not near the coast within our limits: Round Valley, *Westermann*; Clear Lake; Putah Cañon, *Brewer*; Sonoma; Napa City; Alameda; Walnut Creek; Sacramento and San Joaquin Valleys; Mt. San Carlos and southward to Southern California. July–Sept.

2. *A. speciosa* Torr. Stem stout, 2 to $4\frac{1}{2}$ ft. high, leafy to the top; soft-tomentose, or rarely glabrate in age; leaves opposite, oval to ovate or oblong, transversely veined, acute or obtuse, 4 to $5\frac{1}{2}$ in. long; petioles 3 to 5 lines long; peduncle longer than the woolly pedicels; lower umbels with 6 to 10 flowers, the upper with 18 or 20 to as many as 55; petals pink or reddish purple; hoods with a short involute base, above this abruptly contracted into a nearly flat lanceolate portion, the whole fully twice as long as the stamen-column; horns much exserted, incurved over the central disk; follicles soft-spiny, at least toward the apex.

Along streams: Solano Co.; common in the Sierra Nevada. Marin, Contra Costa and Alameda Cos., acc. to Greene. Last of May–July.

3. *A. eriocarpa* Benth. Stems $1\frac{1}{2}$ to 3 ft. high, more or less sharply angled below; herbage hoary-tomentose, in age more or less deciduous; some of the leaves in whorls of 3 or 4, all broadly oblong with truncate base, rounded or acute at apex, 5 to 7 in. long, short-petioled; umbels few or several, mostly corymbose-clustered toward the summit, on peduncles equaling or rather longer than the pedicels; flowers $3\frac{1}{2}$ lines long; corolla creamy white; hoods with slight purplish tinge, shorter than the anthers, cleft a short distance down the back, the acute sickle-shaped horn little protruded from between the acute teeth of the cleft.

Dry ground: Potter Valley (Mendocino Co.) and Big Valley (Lake Co.) to Ætna Springs (Napa Co.) and eastward to Putah Pass, *Jepson*. Also in Santa Clara Co. and Monterey Co. and southward to Fort Tejon and Southern California. July–Aug.

A. FREMONTI Torr. Similar to no. 3; umbels 1 or 2; peduncles not longer than the pedicels; hoods nearly erect, equaling the anthers, rather evenly truncate; horn broad, its apex subulate, inflexed and a little exserted.—Chico; Upper Sacramento; Little Lake, Mendocino Co., acc. to Bot. Cal. To be looked for near Ukiah.

4. *A. vestita* H. & A. Two and one-half to 3 ft. high, unbranched, white-woolly, at length densely floccose; leaves opposite, ovate to oblong-lanceolate, the upper more acuminate and often subcordate at base, short-petioled or the upper sessile, 4 to 6 in. long; umbels 1 to 4, the lateral sessile, the terminal peduncled; corolla greenish white or purplish, tomentose on the outside, its lobes 3 lines long; hoods truncate at summit and entire, not exceeding the stamen-column; horn or crest blunt, not exserted, attached to the hood.

Southern California; southern Sierra Foothills; near San Francisco and Monterey acc. to Bot. Cal.

5. **A. cordifolia** (Benth.). Stems $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; herbage green and more or less purplish, perfectly glabrous; leaves mostly opposite, rarely in 3's, ovate-lanceolate, with the lower round or elliptic-ovate, the upper ovate to ovate-lanceolate with cordate-clasping base, 2 to 4 in. long; umbels loosely many-flowered, mostly in the axils of bracts at the naked summit of the stem, the filiform pedicels equaling or shorter than the peduncles; corolla dark red-purple, its lobes 3 or 4 lines long; hoods purplish, oblong, the summit obliquely truncate dorsally and produced at the ventral margins into an ascending cusp, the fissure down the front narrow; follicle glabrous, 2 to $3\frac{1}{2}$ in. long, often long-attenuate.—(*Gomphocarpus cordifolius* Benth.)

North Coast Ranges at middle altitudes (Vaca Mountains, Napa Mountains, etc.); Sierra Nevada; Mt. Shasta.

6. **A. Californica** Greene. Vegetative aspect of *A. vestita*, but commonly stouter and lower; leaves opposite, ovate or broadly oblong, 4 in. long, somewhat more or less, sharply acuminate; umbels nearly sessile, rather few-flowered; corolla purplish; hoods dark maroon, nearly orbicular, laterally compressed, centrally attached and reaching nearly to the middle of the anthers, 2-cleft half-way down the back and destitute of horn.—(*Gomphocarpus tomentosus* Gray).

"Hill north of Coal Mine, Mt. Diablo," *Brewer*, May 20, 1862; Southern California. Apr.—May.

2. **SOLANOA** Greene.

Perennial herb with strongly flattened stems and opposite leaves. Umbels small, terminal, globose, densely many-flowered, the peduncles longer than the pedicels. Flowers purplish red outside, flesh-color within. Hoods cleft dorsally from top to bottom. Horns none. (The Indian chief, Solano, of the Suisunes.)

1. **S. purpurascens** (Gray) Greene. Stems 2 or 3 from a stout taproot, about 1 ft. long, prostrate, flexuous, purplish and purple dotted, the herbage canescently-puberulent but green; leaves thick, the lowermost elliptic-ovate, the upper broadly cordate-ovate, 1 to 2 in. long; umbels 2; flowers purplish red outside, flesh-color within, about 2 lines long; follicles 2 in. long, about 5 lines in diameter at the widest part.—(*Gomphocarpus purpurascens* and *Schizonotus purpurascens* Gray.)

North Coast Ranges: open summit of a mountain near the Geysers, Sonoma Co., *Towle*, June, 1874; Snow Mountain, Lake Co., *Brandegee*; Fout's Springs, Colusa Co., *Rattan*, June, 1884; Soldiers' Ridge, Yallo Bally Mountains, July, 1897, *Jepson*, growing on the driest rocky slopes; the only known stations.

83. **OLEACEÆ.** ASH FAMILY.

Trees or shrubs with opposite and (in ours) pinnate leaves. Calyx 4-cleft or none. Corolla regular, 2 to 6-cleft or -petalous, or none.

Stamens 2, 3, or 4. Ovary superior, 2-celled with 2 or more ovules in each cell. Seeds anatropous, with a large straight embryo in hard fleshy endosperm or the endosperm lacking. The typical Oleaceæ have simple leaves and a drupaceous fruit as in the Olive of cultivation.

1. FRAXINUS L. ASH.

Leaves unequally pinnate, exstipulate, deciduous. Flowers small, in small crowded panicles, appearing just before the leaves and from separate buds, diœcious or polygamous. Stamens (in our species) 2. Stigma 2-lobed. Fruit a 1-seeded samara, with terminal wing. (Classical Latin name of the Ash-tree.)

Flowers diœcious; corolla none; leaflets mostly sessile, 2 in. long or more.

Flowers mostly perfect; corolla present; leaflets mostly petiolate, less than 2 in. long. 1. *F. Oregona*.
 2. *F. dipetala*.

1. *F. Oregona* Nutt. OREGON ASH. Tree 15 to 30 ft. high in our district; leaves 6 to 11 in. long; leaflets 5 to 7, oblong to oval, acute, entire or somewhat serrate toward the apex, pubescent, especially beneath, glabrate in age, the lateral sessile or short-petiolulate, 2 to 5½ in. long; flowers diœcious; calyx of staminate flower very short and truncate or almost none; stamens commonly 2, sometimes 3, rarely 1; calyx of pistillate flower with toothed lobes, shorter than the ovary, persistent; ovary contracted into a stout style with 2 conspicuous stigmatic lobes; fruit oblong-lanceolate, 1¼ to 2 in. long; body of fruit clavate, 6 to 7 lines long, with edges margined from near the base, widening above into a longer wing.

Along the Sacramento River and Coast Range streams, especially toward the coast: Stockton, *Sanford*; Napa Valley, *Torrey*; Cazadero, *Setchell*; Ross Valley, *Jepson*. Always in rich soil. Apr.-May. Fruiting from June to Nov.

2. *F. dipetala* H. & A. Shrub, 5 to 12 ft. high; leaves 2 to 6 in. long; leaflets 3 to 9, green above, yellowish green beneath when young, oblong, coarsely serrate above the middle, mostly petiolulate, ¾ to 1½ in. long; flowers mostly perfect; calyx less than a line long; corolla white, 3 lines long, consisting of 2 distinct oval petals abruptly narrowed at base into very short claws; stamens as long as the corolla; filaments slender, shorter than the anthers; style slightly lobed at apex; fruit linear- to spatulate-oblong, the terminal wing frequently emarginate at apex.

Cañon sides, Coast Ranges: Vaca Mountains, *Jepson*, southward to San Bernardino Co., *Parish*.

84. CONVOLVULACEÆ. MORNING-GLORY FAMILY.

Chiefly twining or prostrate herbs, or one species suffrutescent. Leaves alternate, or the plants leafless and parasitical. Flowers regular, perfect, 5-merous (rarely 4-merous), except the pistil which is commonly 2-merous. Sepals distinct, imbricated, persistent, often unequal. Corolla usually showy, campanulate, plaited in the bud.

Stamens attached near the base of the corolla. Ovary superior, commonly 2-celled, with 2 ovules in each cell. Styles 1 or 2. Fruit most frequently a capsule. Embryo with folded cotyledons.

Ovary 2-parted; styles 2, distinct or united at base only; creeping herbs . . . 1. *DICHONDRA*.

Ovary entire.

Style 1, entire or cleft at the apex only; prostrate or twining herbs, one species woody at base . . . 2. *CONVOLVULUS*.

Styles 2, distinct.

Erect non-twining leafy herb . . . 3. *CRESSA*.

Parasitic leafless twining herbs . . . 4. *CUSCUTA*.

1. *DICHONDRA* Forst.

Creeping perennial herbs with filiform stems. Leaves reniform or round-cordate, entire. Peduncles short, naked, 1-flowered. Corolla deeply 5-cleft or -parted, the lobes imbricated in the bud. Stamens short. Ovary 2-parted, forming 2 indehiscent or irregularly bursting utricles in fruit. Styles 2, distinct or united at base. Seed solitary. Cotyledons linear, entire. (Greek *di*, double, and *chondra*, grain, on account of the deeply parted or twin fruit.)

1. *D. repens* Forst. Stems slender, partly subterranean, rooting freely; leaves glabrous or soft-pubescent, $\frac{1}{2}$ to 1 in. wide, on long petioles; corolla yellow, 1 to $1\frac{1}{2}$ lines long, rather shorter than the obovate to spatulate sepals.

Introduced: Mt. Tamalpais; Mountain Lake, San Francisco; near Ocean View; Monterey.

2. *CONVOLVULUS* L. BINDWEED. MORNING-GLORY.

Twining or prostrate herbs. Sepals 5. Corolla funnelform to campanulate. Style entire, or cleft at the apex only. Stigmas 2, ovate to linear. Stamens included. Capsule globose with 4 seeds in 2 cells (or by abortion 1-celled), mostly 2 to 4-valved. (Latin *convolvere*, to entwine.)

Flowers showy, 1 to 2 in. long; perennials.

Calyx enclosed by a pair of broad bracts; peduncles 1-flowered; perennial herbs.

Corolla pink, purple, or lavender.

Leaves reniform, glabrous; slightly succulent seaside herb . . . 1. *C. Soldanella*.

Leaves ovate-lanceolate, sagittate at base, acuminate at apex, 2 in. long, sparsely hirsute; bracts cordate at base. 2. *C. sepium*.

Corolla white or creamish; leaves ovoid or deltoid, sagittate, mostly 1 in. long; trailing or often nearly acaulescent.

Herbage white with a velvety tomentum . . . 3. *C. villosus*.

Herbage green . . . 4. *C. subacaulis*.

Calyx not enclosed by bracts; peduncles often more than 1-flowered; leaves sagittate.

Stems climbing over shrubs and trees, woody below; bracts subulate-lanceolate, situated about their own length from the calyx . . . 5. *C. luteolus*.

Stems herbaceous, prostrate; peduncles with a pair of bracts near the middle . . . 6. *C. arvensis*.

Flowers small, 3 lines long; leaves not sagittate; annual. 7. *C. pentapetaloides*.

1. *C. Soldanella* L. SHORE MORNING-GLORY. Stems prostrate,

$\frac{3}{4}$ to $1\frac{1}{2}$ ft. long; herbage glabrous and slightly succulent; leaves thick, reniform, deep green and shining, 1 to 2 in. broad, mostly broader than long, on stout petioles; corolla short and rather broadly funnelform, $1\frac{1}{2}$ to 2 in. broad, pinkish or pale purple; capsule becoming 1-celled.

Sandy beaches of the seashore: San Francisco and north and south along the coast. Apr.—June.

2. *C. sepium* L. HEDGE BINDWEED. Stems from a slender horizontal rootstock, often several ft. long, climbing on herbaceous plants or trailing; herbage nearly glabrous; leaves ovate-lanceolate, acuminate at apex, hastate at base, 2 to 3 in. long, on slender petioles shorter than the blade; peduncles longer than the leaves, 1-flowered; bracts ovate, cordate at base, completely enclosing the calyx; corolla pinkish, 1 to 2 in. long.—(*C. limnophilus* Greene.)

Introduced in the Suisun Marshes. June. The plant of the Eastern U. S. often has white flowers, as is likely to be the case with us.

3. *C. villosus* (Kell.) Gray. Similar to the next in habit and equally variable, the whole plant white with a dense velvety tomentum; leaves sharply triangular or ovoid, sagittate, the lobes entire or shallowly sinuate; peduncles 1-flowered, often flexuous or curved, especially in age; corolla funnelform, creamy white, $1\frac{1}{2}$ in. long or less.

High dry slopes of the Coast Ranges: Monterey; Mt. Diablo; Conn Valley, Napa Co.; Mt. St. Helena and northward to Mt. Shasta. Sierra Nevada. May—June.

4. *C. subacaulis* (H. & A.) Greene. Stems 1 to 15 in. long, when short erect, when longer trailing, or frequently acaulescent; leaves thin, hirsutulous with somewhat appressed hairs, ovoid or deltoid, hastate or truncate at base, mostly 1 in. long; peduncles 1-flowered, $\frac{1}{4}$ to 1 in. long; bracts smallish, embracing but not enclosing the calyx; corolla campanulate-funnelform, angularly 5-lobed, $1\frac{1}{2}$ to 2 in. broad, white or creamish, with purplish exterior.

Dry hills from Vacaville and Conn Valley (Napa Co.) to Santa Clara Co., Monterey and southward. Apr.—June.

5. *C. luteolus* Gray. Climbing over trees and shrubs 5 to 20 ft. in height, the stems woody below; leaves glabrous and glaucous, sagittate at base, the upper portion or terminal lobe varying from triangular to narrowly lanceolate; basal lobes large, very variable, sometimes nearly as large as the terminal lobe, angular, shallowly 2-lobed or somewhat saliently and acutely lobed; blades 1 to 2 in. in length from summit of petiole to apex, the width from tip to tip of lobes often as much or more; peduncles 1 to 5, commonly 1 to 3-flowered, 2 to 5 in. long; bracts subulate-lanceolate or oblong and acute, distant their length to $\frac{1}{4}$ their length from the calyx; corolla open-funnelform, white, the exposed portion of the folds purplish, 1 to $1\frac{1}{2}$ in. long; limb not lobed, scarcely angular; capsule 1-celled.

Common throughout the Coast Ranges. Apr.—June; or near the

coast flowering until Nov. Passing into *C. occidentalis* Gray of Southern California in which the bracts are larger and enclose the calyx.

Var. *Solanensis*. Largest leaves $2\frac{1}{2}$ in. broad, almost triangular, the lateral margins from the outer angle of the lobes to the apex nearly straight; basal lobes shallowly sinuate.—Vaca Mountains.

Var. *purpuratus* Greene. Limb of corolla rose-purple, varying to white on the same plant.—Angel Island; Marin Co.; Presidio, San Francisco.

6. ***C. arvensis* L.** COMMON BINDWEED. Perennial; herbage minutely villous-pubescent or almost glabrous; stems prostrate, 1 to several ft. long, from roots which descend to great depth; leaves oblong- or triangular-sagittate, $\frac{1}{2}$ to 1 or 2 in. long, on petioles $\frac{1}{2}$ as long; peduncles commonly 1 (sometimes 2 or 3)-flowered, with a pair of subulate or spatulate bracts near the middle; corolla white, purplish outside, neither lobed nor angled, 1 to $1\frac{1}{2}$ in. broad.

The most troublesome weed yet naturalized in California, especially vexatious to horticulturists and vineyardists. Flowering from May through the summer and autumn.

7. ***C. pentapetaloides* L.** Diffusely branched from the base, the branches 6 to 18 in. long, puberulent or hairy; leaves linear or oblong-oblancoate, narrowed to a petiole, 1 to 3 in. long; peduncles with a pair of small spatulate or subulate bracts below the flower, 1-flowered, retrocurved in fruit, $\frac{1}{2}$ to 1 in. long; sepals more or less hairy with subscarios margin; corolla purplish, 3 lines long, deeply 5-cleft.

Naturalized from Europe: Lower San Joaquin Valley; Antioch, *Mrs. Curran*, June, 1884; *Estrella, Jared*.

3. **CRESSA L.**

Low canescent perennial herb with erect or diffuse non-twining stems. Sepals 5, nearly equal. Corolla white, its tube oblong-campanulate, equaling the sepals; limb 5-parted into lightly convolute-imbricate lobes which are somewhat induplicate in the bud. Filaments filiform, exserted from the throat of the corolla; ovary 2-celled, 4-ovuled. Capsule by abortion often 1-seeded. (Greek *Kressa*, a Cretan woman.)

1. ***C. Cretica* L.** Commonly densely branched from the base, forming low tufted plants 3 to 6 in. high; leaves oblong-ovate, 2 to 4 or 5 lines long, almost sessile; flowers short-pedicel in the axils; sepals oblong-ovate, acute, 2 lines long; corolla-lobes oblong-ovate; ovary long-hairy.

Alkaline lands from near Vacaville southward, especially common in the San Joaquin Valley, often covering thousands of acres. May.

4. **CUSCUTA L. DODDER.**

Annual parasitical leafless herbs, destitute of green color, with twining filiform stems. Flowers small, in lateral heads or clusters. Calyx colored like the corolla, deeply 5-cleft. Corolla campanulate

or somewhat urn-shaped to short-tubular, with 5 usually spreading lobes imbricated in the bud, and as many small scales or appendages inserted in the tube below the stamens, or none. Ovary globular, 2-celled, 4-ovuled. Styles in ours distinct, persistent. Stigma globose. Capsule 1 to 4-seeded, ours indehiscent. The embryo is devoid of cotyledons. The seed germinates on the ground and the twining stems become parasitic by means of suckers which penetrate the bark of the host. (Derivation doubtful.)

Capsule pointed or conical; corolla-tube with fimbriate scales.

Corolla-lobes $\frac{1}{2}$ as long as the cylindrical tube 1. *C. subinclusa*.

Corolla-lobes as long as the shallow-campanulate tube 2. *C. salina*.

Capsule depressed-globose.

Flowers in dense globose clusters; scales present 3. *C. arvensis*.

Flowers in loose cymes; scales none 4. *C. Californica*.

1. **C. subinclusa** Dur. & Hilg. Stems commonly stout; flowers $2\frac{1}{2}$ to 3 lines long, sessile or short-pedicel, at length in large dense clusters $\frac{1}{2}$ to $1\frac{1}{2}$ in. thick; calyx-lobes overlapping, ovate-lanceolate, about $\frac{1}{2}$ the length of the cylindrical corolla-tube; lobes of the corolla ovate-lanceolate, minutely crenulate, scarcely more than $\frac{1}{2}$ the length of the tube; anthers oblong or oval, nearly sessile; scales narrow, fimbriate, opposite the stamens but reaching only to the middle of the tube; styles slender, mostly longer than the ovary; ovary capped by the withered corolla.

Very common on Poison Oak and other shrubs and herbs, often occurring on Salix and making thick tangles 1 to 2 ft. across. Calyx sometimes reddish; lobes of the corolla mostly erect; tube sometimes narrowed above.

2. **C. salina** Engelm. MARSH DODDER. Stems slender; flowers $1\frac{1}{2}$ lines long; calyx-lobes ovate-lanceolate, as long as the shallow-campanulate tube of the corolla and as the corolla-lobes; these ovate, denticulate, overlapping; filaments about as long as the oval anthers; scales fringed, mostly shorter than the tube, sometimes much reduced and on the base of the tube; styles equaling or shorter than the ovary; capsule surrounded by the withered corolla, mostly 1-seeded.

Very abundant on Salicornia and other saline herbs, entangling them with its webs of thread-like stems, which in spring color the salt marshes with small patches of golden color. Flowering July-Sept.

3. **C. arvensis** Beyrich. Stems pale; flowers in dense globose clusters $\frac{1}{2}$ in. thick; calyx-lobes obtuse, broad; corolla 1 line long, with acuminate lobes and short and broad tube, in age remaining at base of capsule; scales deeply fringed.

Alvarado Marshes, on Xanthium.

4. **C. Californica** Choisy. Stems capillary; flowers small, 1 to $1\frac{1}{2}$ lines long, in loose cymes; pedicels frequently much thickened below the flower; calyx-lobes with short-attenuate spreading tips; corolla-lobes lanceolate-subulate, equaling or longer than the campanulate tube, mostly reflexed in anthesis; scales none, sometimes represented by inverted arches or V-shaped thickenings alternating with

the stamens, but situated near the base of the tube; anthers linear-oblong, nearly or quite equaled by the filaments; styles slender, mostly longer than the ovary; capsule depressed-globose, mostly 2 or 3-seeded.

On *Eriogonum*, *Adenostoma*, etc. Infrequent in the Bay Region: Conn Valley; Morrison Cañon, Niles, June 20, 1897, in fl., anthers sessile at the sinuses of the corolla; Pacheco Pass, on *Eschscholtzia*, *Brewer*, no. 1292.

85. SOLANACEÆ. NIGHTSHADE FAMILY.

Ours herbs (one species a soft-woody shrub) with alternate leaves. Flowers hypogynous, regular, perfect and commonly 5 (rarely 4)-merous, except the superior ovary which is 2-celled or falsely 4-celled. Flowers solitary, umbellate, cymose or paniculate, on lateral or terminal peduncles. Calyx toothed, lobed or cleft. Stamens as many as the lobes of the corolla and alternating with its divisions. Fruit a berry or a capsule.

Corolla tubular or funnelform; fruit a capsule.

Capsule 2-celled, smooth; flowers in a terminal panicle . . . 1. *NICOTIANA*.
Capsule falsely 4-celled, prickly; flowers solitary, very large . . . 2. *DATURA*.
Corolla rotate; fruit a berry; flowers in umbels or cymes . . . 3. *SOLANUM*.

1. *NICOTIANA* L. TOBACCO.

Heavy scented usually viscid-pubescent herbs (except one) with entire leaves and paniced flowers. Calyx persistent, more or less investing the fruit, 5-toothed or -lobed. Corolla funnelform or salverform, plicate and somewhat imbricate in the bud. Filaments filiform, mostly included. Ovary 2-celled, with large and thick placentæ. Fruit a smooth 2-celled capsule, septical, and the valves promptly 2-cleft at apex, thus seeming as if 4-valved. Seeds small, numerous. (Jean Nicot, 1530-1600, French diplomat and author of the most ancient dictionary of the French language, but more celebrated as having introduced tobacco into France from Portugal.)

Annuals; flower white.

Cauline leaves sessile; calyx-teeth as long as tube; corolla-limb broad. . .

Cauline leaves petioled; calyx-teeth commonly short, $\frac{1}{4}$ to $\frac{1}{4}$ as long as tube; corolla-limb narrow. 1. *N. Bigelovii*.
Perennial soft-woody shrub; flowers yellow; throat of corolla constricted under the narrow limb. 2. *N. attenuata*.
3. *N. glauca*.

1. *N. Bigelovii* Wats. Stem simple at base and branched above, or branched near the base, $1\frac{1}{2}$ to 2 ft. high; herbage with glandular indument, very ill-smelling; radical leaves oblong-ovate, acute, petioled; cauline similar, sessile (the lower sometimes petioled), often contracted above the middle into a lanceolate apex, the uppermost lanceolate; flowers few, mostly remote along the branches; calyx with slender teeth as long as the tube; corolla-tube $1\frac{1}{2}$ in. long, the limb 1 in. wide; filaments unequally inserted high in the tube, glabrous; capsule obtuse, shorter than the calyx.

Lake Co.; Russian River Valley; Napa Valley; Princeton; plains of Solano Co. and southward in the San Joaquin Valley. July–Sept. Flowers closing during the day and opening in the evening. This and the next used by the Indians as a smoking tobacco.

2. *N. attenuata* Torr. Habit of the preceding; glandular-pubescent and odorous much as the preceding; lower leaves broadly ovate, the upper varying to narrowly lanceolate, all petioled; flowers many, disposed in clusters along and terminating the branches; calyx-teeth triangular-lanceolate, $\frac{1}{4}$ or $\frac{1}{3}$ the length of the calyx-tube, rarely subulate and as long; corolla-tube 1 in. long, with narrow limb 3 to 5 lines in diameter; filaments equally inserted low down in the tube, pubescent below the middle; capsule longer than the calyx, at least in the forms with short calyx-teeth.

Common throughout California, especially towards the interior: Napa Valley; Stockton, etc. July–Nov. Vespertine as the last.

3. *N. glauca* Graham. TREE TOBACCO. Soft-woody evergreen shrub 6 to 15 ft. high, very slender and loosely branching, with glabrous and glaucous herbage; leaves ovate, entire, 8 in. long, on petioles 4 in. long; uppermost leaves reduced, ovate to oblong; flowers in terminal panicles; calyx unequally 5-toothed, $1\frac{1}{2}$ in. long; corolla $1\frac{1}{2}$ in. long, its tube dilated above summit of the calyx, the stamens inserted at this point; throat of corolla constricted just below the short shallowly 5 (occasionally 4)-lobed limb; anthers and stigma in throat of corolla; ovary seated on a yellowish disk; capsule oblong, $\frac{1}{2}$ in. long.

Introduced from southern South America and becoming common in waste places about interior towns: Vacaville (first noted about 1887); Napa Valley; San Leandro, *Davy*; abundant in Alameda Creek near Niles; New Almaden; Hollister, *Setchell*; San Joaquin Valley.

2. DATURA L. THORN-APPLE.

Coarse rank-smelling herbs. Flowers large, on short peduncles in the forks of the branching stem. Calyx prismatic or tubular, 5-toothed, in our species at length circumsessile near the base, the lower part persisting as a collar or rim beneath the capsule. Corolla funnelliform with ample limb, convolute-plicate in the bud. Stamens included; filaments long and filiform. Stigmas bilamellar. Capsule prickly or spiny, 4-valved from the top or the valves indefinite; the placenta project from the axis into the middle of the cells and connect with the walls by a partition imperfect at the top and thus form a falsely 4-celled ovary and capsule. (Derived from the Hindoo name, dhatura.)

Calyx not prismatic, tubular; corolla large, 6 to 8 in. long; capsule nodding on the short recurved pedicel, indefinitely valved or bursting irregularly, the subtending persistent base of the calyx rotate. . . . 1. *D. meteloides*.

Calyx prismatic; corolla comparatively small, 4 in. long or less; capsule erect, definitely 4-valved, the subtending persistent base of the calyx reflexed.

Corolla purple; spines subequal. 2. *D. Tatula*.

Corolla white; spines very unequal. 3. *D. Stramonium*.

1. **D. meteloides** DC. **TOLGUACHA.** Erect branching plant, 2 or 3 ft. high; leaf-blades broadly ovate, sinuate-dentate below the acute apex or nearly entire; petioles $\frac{1}{3}$ to $\frac{2}{3}$ as long; calyx cleft into 5 lanceolate teeth; corolla with funnellform throat; limb 3 to 6 in. wide, with 5 slender subulate teeth $\frac{1}{2}$ to $\frac{3}{4}$ in. long; anthers white, $\frac{1}{2}$ in. long; capsule globose, 1 in. long, densely spiny; spines short, 2 lines long, pustulate-dilated and pubescent at base; seeds 2 lines long, light-colored, flat, smooth.

Widely distributed in California from Lagoon Valley, Solano Co., to Stockton and southward to Southern California. Common in the San Joaquin Valley. July-Sept.

2. **D. Tatula** L. **PURPLE THORN-APPLE.** Plants 1 or 2 ft. high; stems purplish; corolla purplish, 3 to 4 in. long, the limb 2 in. wide or less; anthers purple, 2 lines long; capsule ovoid, with many very stout subequal prickles; seeds thickish, brown, finely pitted and rugose, or with umbilicate markings.

Introduced, not common: Russian River Valley; Olema, Marin Co.; Monterey.

3. **D. Stramonium** L. **STRAMONIUM.** Similar to the preceding, but the stems greenish and the flowers white; capsule with few spines, the lower much shorter than the very stout upper ones which are $\frac{3}{4}$ in. long.

Introduced, rare: Stockton, *H. P. Fitch.*

3. **SOLANUM** L. **NIGHTSHADE.**

Ours herbs. Flowers in umbels on short lateral or terminal peduncles. Calyx of 5 divisions. Corolla rotate, 5-lobed, with scarcely any tube. Anthers almost sessile, lightly connate into a cylinder surrounding the style, opening by a small pore at the apex or longitudinally dehiscent. Fruit a berry with several seeds. (Latin name of the Nightshade, from solamen, quieting.)

Annual; peduncles longer than the pedicels; corolla small, 5-cleft; var. *Douglasii* of 1. *S. nigrum.*

Perennial; peduncles much shorter than the pedicels or almost none; corolla larger, 5-angled or -lobed, with greenish glands at base.

More or less suffrutescent; pubescence tomentose, of branched hairs. 3. *S. umbelliferum.*

Herbaceous or nearly so; pubescence viscid, of simple hairs. 2. *S. Xanti.*

1. **S. nigrum** L. var. **Douglasii** Gray. **BLACK NIGHTSHADE.** Low spreading annual, often several ft. across, dark green and glabrous, more or less conspicuously scabrous on the angles of the stem; leaves elliptic-ovate, acute, narrowed to a petiole, entire, toothed or angulate-sinuate, 1 to 3 in. long or the very lowest 5 in. long; corolla small, whitish, aging to purplish, 2 to 3 lines broad, its segments oblong-lanceolate and ciliolate toward the apex; filaments and style pubescent; fruiting peduncles $\frac{1}{2}$ in. long or more, bearing 3 to 5 berries on more or less recurved pedicels; berries blue-black, nearly as large as peas.

Waste ground, commonly in shade or in moist places, flowering through the summer into early winter. Plants from the south (Monterey to Southern California) have corollas 5 lines wide.

S. VILLOSUM Lam., a villous-hirsute annual of the Old World with minute white corollas and green berries, was collected at West Berkeley, 1891, by Greene. *S. TUBEROSUM* L., the Common Potato, with leaves pinnate and large and minute leaflets intermixed, is occasionally found beyond the boundaries of cultivated fields (Howell Mountain).

2. *S. Xanti* Gray. Stems herbaceous, several to many from a perennial base, erect or decumbent, mostly simple, slender and sparsely leaved, $1\frac{1}{2}$ to 2 ft. long; pubescence somewhat viscid and of simple hairs; leaves thinnish, elliptic-ovate, at base obtuse, truncate or subcordate, on petioles 5 lines long or less; flowers few in an umbel or cyme, light azure or fading darker blue, 5 or 6 lines in diameter.

High mountain ridges near Vacaville; common in Southern California (the flowers a full inch in diameter); occasionally collected in the Sierra Nevada at middle elevations. Mar.-May.

3. *S. umbelliferum* Esch. More or less suffrutescent, 2 to 3 ft. high, the stems deep green, mostly 5-angled or -ridged; finely pubescent-tomentose, the hairs branched; leaves elliptic-ovate, 1 to 2 in. long or less, thickish, on petioles 2 to 3 lines long; flowers in umbels; peduncles short or almost none; the pedicels 4 to 8 lines long; calyx 5-lobed, corolla blue, sometimes white, 10 lines broad, shallowly 5-lobed with 5 pairs of greenish glands near the base; anthers 2 lines long, the filaments merely evident; berry when fully ripe, dull white with a greenish tone toward the base, 4 to 8 lines in diameter.

Hill country of the Coast Ranges, especially along gulches or in cañons toward the coast (apparently not in inner Coast Ranges); Sierra Foothills. Flowering all the year. The notes which follow were derived from plants at Berkeley. Pedicels and calyx often purplish. Calyx-lobes variable in their degree of union. Umbels on lateral branchlets which are often borne on the upper portion of long sterile shoots of the preceding year. The terminal umbels soon become lateral by the development of the branch in the axil of the first leaf below the inflorescence. Branches soon naked by the early fall of the leaves, the joint just above the base of the petiole marked by a faint transverse purple band; persistent leaf-base conspicuous; some of the leaves rarely 2 or 3-lobed at base or pinnatifid.

Greene has a *S. CUPULIFERUM* (Erythea, iii. 12) from Marin and Napa Cos., distinguished by its depressed habit, papillose-scabrous herbage, short simple pustulate hairs, pedicels 1 in. long and flat rotate corolla not wavy by the elevation of the middle of each lobe as in *S. umbelliferum*.

86. SCROPHULARIACEÆ. FIGWORT FAMILY.

Ours herbs excepting *Diplacus* and some species of *Pentstemon* and *Castilleja*. Leaves opposite or alternate. Flowers complete. Stamens 4, in 2 pairs (one pair shorter than the other), or one pair sterile, or stamens 2 only, always inserted on the corolla. *Verbascum* has 5 perfect stamens and in several genera the fifth stamen is present as a sterile filament or rudiment. Corolla commonly bilabiate, with 2 lobes in the upper lip (or this galeate), and 3 in the lower, or sometimes nearly regular and with either 4 or 5 lobes. Calyx synsepalous or sometimes chorisepalous. Ovary superior, 1-celled; style 1. Fruit a 2-celled, 2-valved capsule, with septicidal or loculicidal dehiscence, or opening near the apex by pores; seeds numerous or often few, with a minute mostly straight embryo in abundant endosperm. An important family biologically, the species in California numerous, and many of them the showiest of West-American plants. All of the Californian genera are represented in the region of San Francisco Bay, save the monotypic annual *Mohavea*, of the Mohave desert; this allied to *Antirrhinum*, but fertile stamens only 2. Few extra-limital species are here noticed, since as a whole they are to be recognized only by critical marks.

A. Leaves alternate; anther-bearing stamens 5.

Corolla nearly regular, rotate, with short tube; filaments (or some of them) very hairy. 1. VERBASCUM.

B. Leaves opposite, or the upper sometimes alternate; anther-bearing stamens less than 5.

Corolla with a spur or sac at base of tube on lower side, often with a prominent palate nearly closing the throat; stamens 4, all with anthers; capsule opening by pores or chinks near the apex.

Corolla-tube with a sac at base; palate closing the throat. 2. ANTIRRHINUM.

Corolla-tube with a spur at base; palate seldom closing the throat. 3. LINARIA.

Corolla without spurs or sacs at base of tube, bilabiate to nearly regular; upper lip not galeate.

Stamens with anthers 4; fifth stamen present as a sterile filament, scale, or mere gland.

Annuals; fifth stamen present as a rudiment or gland.

Corolla strongly declined, strongly bilabiate; middle lobe of lower lip folded lengthwise into a sac enclosing the stamens and style. 4. COLLINSIA.

Corolla minute, little declined, the lobes rotately spreading; some cauline leaves ternately divided or parted. 5. TONELLA.

Perennials.

Corolla short, inflated, with 4 lobes erect and 1 reflexed; sterile stamen a scale on upper lip. 6. SCROPHULARIA.

Corolla tubular, from strongly to obscurely bilabiate; sterile filament conspicuous, about equaling the fertile ones. 7. PENTSTEMON.

Stamens 4, all with anthers (except no. 10); fifth stamen wholly absent.

Calyx 5-toothed.

Corolla tubular or funnellform, often elongated.

Calyx 5-angled, plicate-carinate or prismatic.

Shrubs

. 8. DIPLACUS.

Herbs.

. 9. MIMULUS.

Calyx not prismatic, slightly 5-sulcate; stamens 4, 2 fertile; annual.

. 10. MIMETANTHE.

Corolla open-campanulate; stems creeping, bearing tufts of leaves and flower-scapes; diminutive annual. 11. LIMOSELLA.

Calyx of 5 almost distinct sepals; stems creeping; perennial. 12. MONNIERA.

Stamens with anthers 2; sterile pair present or none; corolla little or not at all bilabiate.

Calyx of 5 almost distinct sepals; corolla tubular.

Corolla-lips nearly equal; sterile filaments short or none. 13. GRATIOLA.

Lower lip of corolla larger than upper; sterile filaments forked 14. ILYSANTHES.

Calyx 4-parted; corolla 4-lobed.

Stamens 4, 2 sterile; corolla broadly campanulate; leaves in a radical tuft 15. SYNTHYRIS.

Stamens 2; corolla subrotate; leaves mainly cauline. 16. VERONICA.

C. Leaves alternate; stamens 4 (2 in some *Adenostegias*), all anther-bearing.

Corolla tubular, strongly bilabiate, upper lip narrow, concave or galeate and enclosing the stamens and style.

Calyx tubular, laterally compressed, cleft before and behind, the lobes entire or 2-cleft; upper lip of corolla long and narrow, very much longer than the very small 3-toothed lower lip; bracts mainly with colored tips; ours perennials except one 17. CASTILLEIA.

Calyx tubular-campanulate, 4-cleft; upper lip (galea) of corolla similar to no. 17, but not so greatly or not at all exceeding the inflated 3-saccate lower one; bracts sometimes with colored tips; ours annuals. 18. ORTHOCARPUS.

Calyx spathe-like, of 2 distinct leaf-like divisions (or the anterior division wanting); corolla-lips of nearly equal length; bracts never colored, annuals. 19. ADENOSTEGIA.

Calyx narrowly campanulate, 2 to 5-toothed, the orifice often oblique; corolla with narrow tube, strongly bilabiate; upper lip (galea) long, arched; lower lip of 3 small lobes; bracts purple or with foliaceous (green) tips; perennials. 20. PEDICULARIS.

1. VERBASCUM L. MULLEIN.

Usually biennial herbs with tall virgate stems and alternate leaves. Flowers ephemeral, in spikes or racemes. Calyx 5-parted. Corolla rotate, with 5 nearly equal segments, ours commonly yellow. Stamens 5, all with anthers; all or the three posterior filaments woolly-bearded. Stigma undivided or 2-lamellate. Capsule septicidally 2-valved, the valves cleft at apex and the septa parting from the persistent axis, many-seeded. Seeds pitted or roughened. (Corrupted from *Barbascum*, the old Latin name.)

Plants very woolly; flowers sessile 1. *V. Thapsus*.

Plants with green herbage; flowers pediceled 2. *V. Blattaria*.

1. *V. Thapsus* L. COMMON MULLEIN. Stout, densely woolly, 3 to 6 ft. high; radical leaves 6 to 12 in. long, obovate-lanceolate or -oblong; cauline leaves oblong, entire or crenate, crowded, the stem winged by their very decurrent bases; flowers in a very long dense simple spike; spike 1 ft. long or more, and $1\frac{1}{4}$ in. thick, sometimes with one to several short spikes at base; lower filaments mostly naked.

Stream beds of interior water courses, or waste places about old dwellings: North Coast Ranges; very common in the Sierra Nevada. Flowering in summer.

2. *V. Blattaria* L. MOTH MULLEIN. Slender, 2 to 4 ft. high;

herbage green and glabrous, or the inflorescence glandular-pubescent; leaves not decurrent, 4 in. long or less; upper leaves ovate or ovate-lanceolate, dentate, cordate-clasping; lower leaves oblong, more coarsely toothed or pinnatifid, the basal ones narrowed to a short winged petiole; flowers yellow or white, 1 in. broad, in a long loose simple raceme; pedicels longer than the calyx; filaments all bearded with violet woolly hairs.

Introduced from the Old World: St. Helena, *Mrs. O. D. Hunt*; Redwood-Peak; Lower San Joaquin; Lake Co.; and Sierra Foothills opposite Sacramento, acc. to Brandegee. *V. VIRGATUM* With. may be found; its pedicels are in 2's and 3's and not longer than the calyxlobes.

2. ANTIRRHINUM L. SNAPDRAGON.

Annual or perennial herbs with the lower leaves opposite and the upper leaves alternate. Corolla gibbous or saccate at base on lower side; palate closing the throat. Capsule dehiscing by pores at the base of the style; style (in our species) persistent and often deflexed. (Greek *anti*, like, and *rhinon*, nose, because of the snout-like flowers.)

Perennials; no tendril-like branches.

Leaves linear; sepals $\frac{1}{2}$ the length of the corolla 1. *A. virga*.

Leaves lanceolate; sepals equaling or shorter than the corolla. 2. *A. glandulosum*.

Annuals; branches or peduncles disposed to be prehensile.

Peduncles about 1 line long; branchlets slender or filiform, at length twisting 3. *A. vagans*.

Peduncles 2 to 3 in. long, filiform, prehensile. 4. *A. strictum*.

1. *A. virga* Gray. Glabrous, erect, with many virgate stems from a perennial base, $2\frac{1}{2}$ to 5 ft. high; leaves linear, 2 to $3\frac{1}{2}$ in. long, sessile; flowers red-purple in a mostly secund raceme, with subulate bracts; sepals ovate, acute, moderately unequal, scarcely half the length of the corolla; corolla 6 to 7 lines long, the sac at base mammaeform; lower pair of filaments dilated at apex, all geniculate at the very base and all hairy, especially at the geniculation or knee; capsule dehiscing by pores at the base of the style; seeds with the longitudinal wing-like ridges fimbriate.

But few stations known: Howell Mountain; Mt. St. Helena and northward to Lake and Mendocino Cos. June.

2. *A. glandulosum* Lindl. Stem stout, branching, 3 to 5 ft. high, very leafy; herbage glandular-pubescent; leaves lanceolate, sessile, gradually diminishing into the bracts of the inflorescence; bracts equaling or shorter than the oblong tube of the corolla; sepals oblong-lanceolate, unequal; "filaments all moderately dilated upwards."

Mt. Hamilton (acc. to Greene); Santa Cruz, and southward.

3. *A. vagans* Gray. At first simple and erect, at length branching and very diffuse, the branches 6 to 18 in. long; slender or filiform branchlets more or less twisting and disposed to be prehensile; leaves ovate, mostly 3 to 5 lines long, or oblong to lanceolate and mostly $\frac{1}{4}$

to 1 in. long, petioled, the uppermost (especially those of the prehensile branchlets) reduced and 1 line long or less; calyx-segments very unequal, linear, except the large uppermost one; this oblong or elliptic-oblong, nearly equaling the tube of the light purple corolla; corolla 5 to 6 lines long; filaments dilated at apex; style slender, as long as the capsule; seeds muriculate-roughened.

Dry open wooded hills or in cañons of the Coast Ranges: Mt. Hamilton; Niles; Mt. Diablo; Vaca Mountains; Kenwood, etc. July-Aug. Passes into the

Var. **Breweri** (A. Breweri Gray). Slender and less diffuse, with smaller corolla (3 lines long) considerably exceeding the less unequal sepals.—Napa Valley to Clear Lake and northward.

Var. **Bolanderi** Gray. Rather widely spreading, the branches 14 to 20 in. long, sparsely hispid with gland-tipped hairs; leaf-blade $1\frac{1}{2}$ in. long or less, ovate (those of the filiform branchlets orbicular), the lower on petioles 8 lines long, the upper on petioles about $1\frac{1}{2}$ lines long; upper sepal very large, elliptic-oblong, nearly as long or distinctly shorter than the tube of the $\frac{1}{2}$ in. long corolla.—Redwood region, Marin Co. Herbage thought to be glaucous.

4. **A. strictum** (H. & A.) Gray. Erect nearly simple glabrous annual, 1 to 2 ft. high, often climbing by tortile filiform peduncles; lowest leaves ovate-lanceolate, the upper becoming linear or the floral ones filiform and much shorter than the peduncles; calyx-segments linear-lanceolate, little unequal; corolla violet-purple, 5 lines long; the hairy prominent palate nearly closing the throat; fruiting calyx about equaling the crustaceous capsule, this tipped with a straight (not deflexed) style of equal length.

South Coast Ranges (Santa Inez Mountains northward to Arroyo Grande, Monterey Co.). Reported from Mt. Tamalpais by Greene. Apr.—May.

3. **LINARIA** Juss.

Annual or perennial herbs. Lower leaves opposite and the upper alternate, entire in ours. Flowers in bracteate racemes, or solitary and axillary. Calyx 5-parted. Corolla bilabiate, more or less tubular, personate and with a spur at base on the lower side; upper lip erect, middle lobe of lower smallest. Stamens 4. Capsule dehiscing below the summit by 1 or 2 simple or lacerate perforations or chinks, many-seeded. (Name derived from *Linum*, Flax.)

Annual or biennial; flowers blue 1. *L. Canadensis*.
Perennial; flowers yellow 2. *L. vulgaris*.

1. **L. Canadensis** Dum. **TOAD FLAX**. Annual or biennial; flowering stems one or several, erect, 6 to 18 in. high, with linear mostly alternate leaves, those of the procumbent radical shoots broader and oftener opposite or whorled; flowers in a raceme; pedicels erect, not longer than the slender curved spur of the blue corolla.

Sandy soil, rather uncommon: Alameda; hillside above Mill Valley, *H. P. Chandler*.

2. **L. vulgaris** L. **BUTTER-AND-EGGS**. Perennial, erect, 1 to 2½

ft. high; leaves linear, very numerous; flowers yellow in a terminal dense raceme; corolla (including the slender spur) 1 in. long or more.

Berkeley, *Davy*; Point Reyes, *Miss Alice Eastwood*; Valley Ford, *Mrs. K. Brandegee*.

4. *COLLINSIA* Nutt.

Annuals with simple opposite leaves. Flowers whorled, forming a raceme, or axillary and scattered. Calyx campanulate, 5-cleft. Corolla declined (the proper tube very short and the abruptly expanded or gibbous throat forming an angle with it), deeply bilabiate; upper lip 2-cleft, with erect lobes; lower lip larger, 3-lobed, the middle lobe conduplicate or keel-shaped and enclosing the 4 declined stamens and style. Filaments long and filiform, the lower pair inserted higher on the corolla than the others; the gland at base of corolla represents the fifth stamen. Capsule septicidal, the valves soon 2-cleft. (Named for Zaccheus Collins, American botanist, of Philadelphia, 1764-1831. Species variable. The corolla is a striking imitation of the papilionaceous type.)

Upper pair of filaments bearded, the lower glabrous.

Flowers long-pediceled (some or all the pedicels much longer than the flowers), solitary, or the upper in whorls of two or three.

1. *C. sparsiflora*.

Flowers short-pediceled or almost sessile, crowded in whorl-like clusters, the lowest subtended by leaves, the others by bracts.

Herbage staining brown; upper lip of corolla commonly destitute of crests or transverse ridge; flowers yellowish or whitish, usually with purple markings.

2. *C. tinctoria*.

Herbage not staining; upper lip of corolla with a low transverse ridge at its junction with the throat.

Corolla rose-purple or violet, the upper lip paler or whitish; calyx-lobes commonly lanceolate, acute.

3. *C. bicolor*.

Corolla white or nearly white, the lower lip lilac or purple tinged; calyx-lobes oblong, obtuse.

4. *C. bartsiaefolia*.

Filaments all glabrous; upper lip of corolla with a jagged wing-like crest at base of lobes or with a pair of prominent callous teeth on each side; flowers in whorls of 2 to 4, the pedicels sometimes as long as the calyx.

5. *C. Greenei*.

1. *C. sparsiflora* F. & M. Slender, branched from near the base, commonly about 6 in. high; herbage reddish; lowest leaves elliptical, 3 lines long, with 1 or 2 teeth on each side, on petioles nearly as long. the upper oblong to linear, twice as long or more and becoming gradually sessile; corolla 4 to 6 lines long; upper lip bluish or sometimes yellowish at base, purple-dotted at throat, hardly shorter than the lower lip; lateral lobes of lower lip purple; upper lip with an evident transverse ridge or crest; keel sometimes yellowish externally, more or less pilose-pubescent; upper pair of filaments pubescent on the upper side; gland conical or somewhat elongated; seeds concave on one side and convex on the other, acutely margined, about 2 in each cell.

Common in low fields or in wet places on hillsides. Apr.-May.

Var. *arvensis* (*C. arvensis* Greene). Commonly with several nearly erect branches from the base, 1 to 1½ ft. high; lowest leaves often shallowly sinuate; calyx-teeth lanceolate-subulate, twice the

length of the tube; flowers larger (6 lines long).—Napa Valley, Los Guiliocos Valley, and Knight's Valley. Apr.

Var. **Franciscana** (C. Franciscana Bioletti). Stout, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high; leaves ovate-lanceolate, the upper sessile; flowers sometimes 3 to 5 in a whorl; corolla $\frac{3}{4}$ in. long; glands subulate, bearing a rudiment of an anther; seeds 2 to 12 in each cell.—Mission Hills (San Francisco Co.) to Millbrae (San Mateo Co.). Apr.–May. Verging in habit and character towards C. bicolor.

2. **C. tinctoria** Hartweg. Stoutish and often diffusely branching; herbage glandular-viscid above, at least on the branches, and imparting a brownish stain; lower leaves oblong to lanceolate, with short petioles, the upper ovate or triangular-lanceolate, sessile by a broad or subcordate base, serrate or entire; corolla yellowish, or cream-color varying to white, marked with purple lines and dots; throat very strongly saccate-ventricose, forming a right angle with the tube; upper lip and its lobes very short; seeds small, smoothish.

Wooded hillsides: rare in the Coast Ranges (Howell Mountain, Kenwood, Mt. Diablo); common in the Sierra Foothills (where first collected by Hartweg in 1846). June. Examination of fresh material may show in some cases as obvious a transverse ridge at base of upper lip as in next:

3. **C. bicolor** Benth. CHINESE HOUSES. Simple or branching from the middle, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, glabrous or finely pubescent and often viscid above; leaves broadly oblong, or the upper narrowed from the broad base to the apex, serrulate, 2 in. long or less; pedicels shorter than the oblong-acute or lanceolate calyx-lobes; corolla rather less than 1 in. long, with lower lip violet or rose-purple, the upper lilac or white, a little shorter than the lower, the lobes recurved-spreading and with low but distinct crests at the point of junction with the tube; saccate throat very oblique to the tube, bristly within, usually with 3 longitudinal purple lines beneath each lobe of the upper lip; whole corolla sometimes varying to white; gland conical; seeds reticulate-rugose, about 6 in each cell.

Very common in the edges of woods: Coast Ranges; Sierra Nevada; Southern California. Also "alkaline plain, Tulare," Davy. Apr.–June.

4. **C. bartsiaefolia** Benth. Nine in. high or less, finely puberulent and often glandular; leaves thickish or even fleshy, ovate-oblong to linear, about 1 in. long; flower-clusters 2 to 5; calyx usually white-villous, its lobes broad and obtuse; corolla whitish, the lower lip tinged with lilac or purple, less declined than in no. 3, the upper lip with few purple lines or dots above, about the length of the curved gibbous throat, with a transverse callous crest or ridge at its origin; lateral lobes of the lower lip often emarginate or obcordate; upper portion of throat of corolla pubescent inside; upper pair of filaments bearded on the upper side to the middle or above; anthers with divergent lobes; gland sessile and elongated; seeds only 2 in each cell.

Sands near the seashore: Ft. Bragg, acc. to Davy; San Francisco

and southward to Southern California. Also on the Antioch sand-hills. Apr.—June.

5. **C. Greenei** Gray. Slender, diffusely branched, 6 to 8 in. high, glandular-puberulent; leaves linear, or tapering to apex, entire or obscurely dentate; pedicels sometimes as long as the calyx; corolla deep azure-blue; upper lip much shorter than the oblong throat, about half the length of the lower, and very prominently wing-crested or toothed at its origin; lateral lobes of lower lip small; gland small.

Crevices of high rocks near the Geysers, Sonoma Co., *Greene*, June 19, 1874; Black Butte, Mendocino Co., 1884, *Rattan*; stony bed of winter rivulet, Blue Lakes grade from Ukiah, *Dary*, May 30, 1900.

5. **TONELLA** Nutt.

Slender branching annuals. Leaves opposite, entire, dentate or ternately divided. Flowers small, almost like those of *Collinsia*. Corolla scarcely declined, only slightly bilabiate, the lobes subrotately spreading and not obviously dissimilar. Fifth stamen represented by a small gland. Seeds 1 to 4 in each cell. (Origin of name unknown.)

1. **T. tenella** (Benth.). Very slender (with almost filiform branches), 6 in. high; leaves heteromorphic, the lowest rotund to ovate, entire or with deep notch on each side near the apex, 2 to 4 lines long, on petioles longer than the blade; the upper palmately 3-parted or -divided into oblong segments, the middle segment longest; bracts entire, shorter than the pedicels; pedicels in 2's or 3's, as much as 1 in. long; corolla minute, little exceeding the calyx, white or very pale blue, the lobes or some of them purple-dotted; capsule exceeding the calyx; seeds 1 to each cell.—(*T. collinsioides* Nutt.)

Seemingly uncommon within our limits, but easily overlooked: Los Gatos, *Bioletti*; Sonoma; Humboldt Co. and northward to Oregon.

6. **SCROPHULARIA** L. FIGWORT.

Rank perennial herbs with opposite leaves. Flowers small, dull reddish, cymose, the cymes disposed in a narrow terminal panicle. Calyx 5-parted into broad rounded lobes. Corolla with a somewhat globular tube, the two upper lobes longer than the two lateral, all erect except the short deflexed lower one. Stamens with anthers 4, the fifth sterile and adnate to the tube of the corolla, appearing like a scale under the upper lip. Capsule septicidal, many-seeded. (From the Latin *scrofulæ*, the plant a one-time remedy for scrofula.)

1. **S. Californica** Cham. Three to 6 ft. high, glabrous except the finely glandular-pubescent inflorescence; leaves ovate, cordate at base, serrate or incised-serrate; flowers about 4 lines long.

Common in moist places, mostly along gulches in the hills: Coast Ranges; Sierra Nevada; Southern California. May–June. The var. *floribunda* Greene has the panicle with very flexuous branches, and grows along rock outcroppings: Pellejo Hills (Solano Co.) and elsewhere.

7. **PENTSTEMON** Mitch.

Perennial herbs or suffrutescent plants. Leaves opposite, the upper sessile. Flowers mostly showy, in racemes, panicles, or cymes. Calyx 5-parted. Corolla tubular and often inflated, the limb either slightly or strongly bilabiate; upper lip 2-lobed, the lower 3-cleft. Stamens with anthers 4, declined at base, ascending above; fifth stamen represented by a conspicuous sterile filament which is often dilated or bearded. Capsule septicidal (the valves cleft at apex through the persistent base of the style), many-seeded. Seeds angled. (Greek pente, five, and stemon, stamen.)

Anthers densely woolly; corolla red: var. *Sonomensis* of 1. *P. Newberryi*.
Anthers glabrous.

Sterile filament bearded.

Corolla scarlet, 1 in. long; sterile filament bearded its whole length . . .

2. *P. corymbosus*.

Corolla purplish and yellowish, $\frac{1}{2}$ in. long; sterile filament bearded at apex only . . . 3. *P. Lemmoni*.

Sterile filament naked.

Corolla bright vermilion, tubular-cylindric. . . . 4. *P. centranthifolius*.

Corolla blue or purple, tubular at base, ventricose-funnelform above. . . 5. *P. heterophyllus*.

1. ***P. Newberryi*** Gray var. ***Sonomensis***. Stems 8 to 12 in. high from a woody base; leaves coriaceous, orbicular to round-ovate, about 7 lines long, serrulate, rarely inclined to be entire; racemes sessile; sepals narrowly lanceolate; corolla bright red, 1 to $1\frac{1}{2}$ in. long, with nearly equal and not widely spreading segments; lower lip with two densely bearded folds; anthers slightly exserted, densely woolly; sterile filament bearded at apex.—(*P. Sonomensis* Greene, Pitt. ii. 218, where the leaves are described as obcordate.)

Among rocks of the North Coast Ranges: Hood's Peak; Mt. St. Helena. May. The species is found in the High Sierras.

2. ***P. corymbosus*** Benth. Suffrutescent, 12 to 16 in. high, glabrous except the glandular-pubescent inflorescence; leaves oblong, acute at both ends, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, denticulate or entire, short-petioled; flowers in terminal corymbs; sepals linear or somewhat narrowed above; corolla tubular, 1 in. long, scarlet, bilabiate; lower lip abruptly spreading, 3-parted into oblong lobes; upper erect, 2-cleft; filaments all pubescent at the very base, the sterile one bearded its whole length on one side.

Rocky ledges and cliffs of the higher Coast Ranges: Mt. Hamilton; Mt. Diablo; Santa Cruz, acc. to Gray, and northward to Mt. Shasta. July–Aug.

3. ***P. Lemmoni*** Gray. **BUSH BEARD'S-TONGUE**. Of erect bushy habit, 2 to 4 ft. high, with vigorous herbaceous stems from a woody base, rather remotely leaved; leaves light green, ovate, or ovate-lanceolate, acute, $1\frac{1}{2}$ in. long or less, sparsely serrulate; sepals narrowly ovate, acuminate; corolla purplish and dull yellow, small ($\frac{1}{2}$ in. long), with short tube, campanulate dilated throat and spreading lips; sterile filament strongly bearded on one side of the curved apex; capsule 2 lines long.

Coast Range cañons along streams: Vaca Mountains, Solano Co. and northwestward. Also in the Sierra Nevada: Bear Valley (Placer Co.) and northward. Aug.-Sept. Stems of the season glaucous.

4. **P. centranthifolius** Benth. SCARLET BUGLER. Herbaceous, glaucous, 1 to 3 ft. high; leaves ovate to oblong-lanceolate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, with subcordate clasping base; pedicels slender, $\frac{1}{2}$ in. long or less; sepals round-ovate; corolla about 1 in. long, bright vermilion, tubular, hardly bilabiate, the segments nearly equal, except that the two upper are united higher; sterile filament naked; capsule 6 or 7 lines long, including the persistent portion of the style.

Coast Range cliffs: Dunn's Peak, Solano Co.; Monterey Co., *Alice King*, and southward to Southern California; also found on the Antioch sandhills, *Davy*. Apr.

5. **P. heterophyllus** Lindl. Minutely puberulent; of bushy or tufted habit, the stems erect or ascending, many from the base, 1 to $1\frac{1}{2}$ ft. high; leaves linear to lanceolate or broader, $1\frac{1}{2}$ in. long or less; sepals ovate, acuminate; corolla rather abruptly ventricose-dilated above the narrowly tubular base, 1 to $1\frac{1}{4}$ in. long, blue or purple; upper lip short, more or less reflexed, lower longer, spreading; sterile filament naked.

Open places in the Coast Range hills, or even in stream beds. May-June. Mostly with reddish stems. Also distinguishable by its sagittate or horseshoe-shaped and ciliate anthers which dehisce from the apex only to the middle (subgenus *Saccanthera*), the preceding species with divaricate or divergent anther cells, which dehisce their whole length or nearly (subgenus *Eupentstemon*).

8. **DIPLACUS** Nutt.

Evergreen glutinous shrubs with branching pubescence and opposite leaves which are revolute in the bud. Flowers red, orange or salmon-colored, solitary in the axils. Calyx tubular, 5-angled, 5-toothed. Corolla with funnelform tube and rather broad bilabiate limb. Stamens 4. Stigma of two flat lobes, closing together when irritated. Capsule firm-coriaceous, linear-oblong, included in the calyx, with a woody enlargement at the pointed apex, opening down the upper suture only or mainly, the valves spreading out nearly flat and bearing the placentæ on their middle.

1. **D. glutinosus** Nutt. BUSH MONKEY-FLOWER. Low shrub, 2 to 4 ft. high; leaves oblong-lanceolate, revolute, denticulate, glabrous and deep green above, pubescent beneath with branching hairs; corolla buff or salmon-color, $1\frac{1}{2}$ in. long or more, the throat narrow-funnelform, the lobes emarginate, with more or less irregular margin.

Common on cañon sides everywhere in the Coast Ranges. May-Sept.

9. **MIMULUS** L. MONKEY-FLOWER.

Herbs with opposite leaves. Flowers mostly showy, yellow or red, solitary and axillary, or in terminal racemes. Calyx prismatic, 5-angled, 5-toothed. Corolla from tubular to funnelform, with

strongly bilabiate limb or with merely slight inequality of lobes, a pair of bearded or naked ridges running down the lower side of the throat. Stamens 4. Stigma mostly of 2 flat lobes closing together when irritated. Capsule dehiscent by both sutures, dehiscent on one side only, or cartilaginous and indehiscent. Seeds many. (Diminutive of the Latin *mimus*, a comic actor, on account of the gaping or grinning corolla.)

A. Flowers red, crimson, or scarlet.

Acaulescent or short-caulescent dwarf annuals, glabrous or nearly so; corolla red, very large for the size of the plant, with long and often filiform tube; capsule cartilaginous, indehiscent.

Corolla-limb broad; upper lip exceeding the lower; tube filiform, 4 to 6 times the length of the funnelform throat 1. *M. angustatus*.

Lower lip of the corolla almost none; upper lip conspicuous, erect; throat narrowly campanulate or urn-shaped 2. *M. subuniflorus*.

Corolla-limb not very irregular; throat open-funnelform, about $\frac{1}{2}$ the length of the tube; branches (when manifestly caulescent) decumbent. 3. *M. tricolor*.

Caulescent (as all the following) and erect.

Pedicels 1 or 2 lines long or less; corolla red; capsule dehiscent down the upper suture and a little past the apex (rarely to the base) on the lower suture; herbage more or less glandular- or viscid-pubescent.

Corolla-lips strongly unequal.

Calyx narrowly cylindrical, scarcely plicate, orifice very oblique; lower lip of corolla $\frac{1}{2}$ as long as upper 4. *M. Kelloggii*.

Similar but smaller; corolla limb $1\frac{1}{2}$ to 2 lines in diameter 5. *M. Congdoni*.

Corolla-lips little unequal.

Corolla-tube exerted from calyx.

Calyx strongly plicate, the orifice very oblique and the broad teeth unequal 6. *M. Bolanderi*.

Calyx scarcely plicate, the teeth subequal, acute and slender 7. *M. Layneæ*.

Corolla-tube not exerted from calyx; calyx similar to no. 6 8. *M. Rattani*.

Pedicels 1 to $2\frac{3}{4}$ in. long; capsule dehiscent by both sutures (as in all the following).

Robust perennial; corolla bright scarlet, strongly bilabiate, $1\frac{1}{4}$ to 2 in. long 9. *M. cardinalis*.

Slender annual; corolla crimson, scarcely bilabiate. 10. *M. androsaceus*.

B. Flowers yellow or white.

Glabrous or somewhat pubescent, at least not viscid-slimy; stems erect; flowers yellow or white.

Corolla small, subregular and

Straw-yellow; dwarf annual 11. *M. rubellus*.

Nearly white or slightly yellowish; annual 12. *M. latidens*.

Corolla large, golden yellow, purple-dotted or splotched, strongly bilabiate; annual or perennial: vars. of 13. *M. Langsdorffii*.

Slimy viscid-pubescent herbs, with mostly weak and decumbent stems and light yellow subregular corollas.

Annual; corolla $\frac{1}{2}$ in. or less long; calyx-teeth short, $\frac{1}{2}$ line long; leaves petioled 14. *M. floribundus*.

Perennial; corolla about 1 in. long; calyx-teeth $\frac{1}{2}$ length of the tube; leaves mostly sessile 15. *M. moschatus*.

1. *M. angustatus* Gray. Acaulescent, glabrous; leaves linear, $\frac{1}{8}$ to 1 in. long; calyx 2 to 3 lines long; the teeth little unequal; the corolla crimson, purple and yellow-dotted, with filiform tube 1 to $1\frac{1}{2}$ in. long, 4 to 6 times the length of the short funnelform throat; limb broad, upper lip exceeding the lower; capsule short-ovate, not flattened, almost as long as thick; seeds favose-pitted.

Borders of surface streams in the mountains north of San Francisco Bay (Mt. George, Howell Mt); also in the Sierra Nevada. Apr.—May 15.

2. **M. subuniflorus** Greene. Acaulescent or nearly so, about $1\frac{1}{2}$ in. high; leaves rhombic-ovate to oblong, 2 to 4 lines long, entire or crenate-toothed; corolla crimson or red-purple, $1\frac{1}{2}$ in. long, the slender tube twice or thrice the length of the calyx; the throat oblong-urnshaped or campanulate; upper lip conspicuous, erect; lower lip reduced to a narrow 2 or 3-crenate border or consisting of a more prominent tooth-like middle lobe and the lateral lobe obsolete; capsule $\frac{1}{2}$ in. long, very gibbous.

Wet hillsides: Coast Ranges and Sierra Nevada.

3. **M. tricolor** Hartweg. Short-caulescent and erect or the branches 3 to 4 in. long and decumbent; leaves lanceolate to oblanceolate-oblong, $\frac{3}{4}$ to 1 in. long, entire or remotely toothed; corolla rose-purple, $1\frac{1}{2}$ to 2 in. long, with little unequal lips and broadly funnelform throat bearing markings of crimson and yellow; capsule slightly gibbous, compressed.

Edges of vernal pools, plains of the Sacramento and San Joaquin Valleys. Apr. 15–May. The original description is by Lindley (Journ. Lond. Hort. Soc. iv, 222), but the name is credited to Hartweg.

4. **M. Kelloggii** Curran. Erect, simple, 2 to 5 in. high, or occasionally 7 or 8 in. with several branches from the base, viscid-pubescent; leaves broadly ovate to oblong (the lowest elliptic-ovate), mostly attenuate at base to a petiole, $\frac{1}{2}$ to 1 in. long, generally dull purple beneath; calyx narrowly cylindrical (6 lines long and 1 line broad), very oblique, the teeth very short and obtuse; corolla-tube very long and slender, twice as long as the calyx, expanding into the short funnelform throat and broad limb, the lower lip only $\frac{1}{2}$ as long as the upper and more spreading; capsule 4 to 5 lines long, slender, bisulcate, slightly curved outwardly (with the calyx), or sometimes contorted, simulating that of *Oenothera micrantha*.

Mountain slopes: North Coast Ranges; Sierra Nevada (El Dorado Co.). Apr.

Var. **parviflorus** (Greene). Much smaller; corolla scarcely $\frac{1}{2}$ in. long, its tube little exerted.—Vaca Mountains.

5. **M. Congdoni** Robinson. Very similar to the preceding, but usually smaller; corolla rose-purple, about 8 lines long, throat narrow, limb only $1\frac{1}{2}$ to 2 lines in diameter; capsule 2 to 3 lines long, acute, compressed.

Sierra Nevada; Mt. Tamalpais; collected but once within our limits.

6. **M. Bolanderi** Gray. Simple or much branched with erect branches, 5 to 16 in. high, glandular-pubescent and very viscid; leaves lanceolate or oblong, sometimes obovate, sometimes sparingly denticulate at apex, 1 to $1\frac{3}{4}$ in. long, sessile; calyx 2 to 3 lines broad, 5 to 6 lines long, strongly plicate-angled, somewhat contracted at the

very oblique orifice, its teeth acute, the upper much the longest; corolla dark red, 6 to 9 lines long, the tube not slender, moderately exerted; limb about 4 lines broad, the lips of nearly equal length; capsule not exceeding the calyx-teeth, slender, and narrowed to the pointed apex, about 5 lines long, 1 line broad.

Hood's Peak (Sonoma Co.), Lake Co. and northward in the Coast Ranges; Sierra Nevada; Santa Lucia Mountains, acc. to Brandegee. Aug. With the odor of *Nicotiana*, and in some localities called "Wild Tobacco."

7. *M. Layneæ* Greene. Much branched with mostly spreading branches, 4 to 7 in. high, viscid-pubescent and somewhat nigrescent; leaves narrowly ovate to oblong, acute at base and apex, about 6 or 7 lines long; calyx 4 lines long; calyx-teeth sharply acute, slender, exceeding $\frac{1}{2}$ line; corolla red, tubular-funnelform, over $\frac{1}{2}$ in. long, much exerted; capsule acute, exerted.

Coast Ranges: Howell Mountain (but capsule not curved upwards at apex as in type plant from Bartlett Mt., Lake Co.); "Geysers to Highland Springs." Also about Mt. Shasta. Rarely collected.

8. *M. Rattani* Gray. Erect, branched from the base, 4 to 5 in. high; herbage glandular-viscid with a nigrescent indument; leaves obovate, oblong or oblanceolate, mostly tapering above and below, 6 lines long or less; flowers solitary in the axils and condensed at the ends of the branches in somewhat capitate clusters of 2, 3, or 4; corolla-tube scarcely exerted from the narrowly campanulate or in age somewhat urn-shaped calyx; calyx-teeth little unequal; apex of capsule narrow, somewhat curved, exerted.

First collected in Colusa Co., *Rattan*, June, 1884; since then only by Mrs. Brandegee on Bartlett Mt., Lake Co. and on Mt. Tamalpais. The calyx is rather broad, as in *M. Bolanderi*, not narrow as in *M. Kelloggii*.

9. *M. cardinalis* Dougl. Perennial, 1 to 3 ft. high, branched from the base with ascending branches; herbage villous-puberulent, especially on the stems; leaves elliptic-ovate, 2 in. long or more, dentate, scarcely sessile; pedicels in the upper axils, longer than the flowers, commonly longer than the leaves, $\frac{3}{4}$ to $2\frac{3}{4}$ in. long; calyx strongly prismatic, with equal triangular teeth; corolla bright scarlet, $1\frac{1}{4}$ to 2 in. long, the throat yellowish with crimson lines, the tube little exerted from the calyx; upper lip of corolla erect, deeply 2-lobed, the sides turned back until they meet or overlap; lower lip deeply 3-lobed, the lateral lobes reflexed, the middle lobe spreading; capsule chartaceous.

Stream beds, rivulets, or springs of the Coast Ranges and Sierra Nevada. Summer and autumn. The strongly prismatic angles of the calyx follow out into the teeth in such wise that the teeth are conduplicate; each lobe of the corolla is rather strongly emarginate; anthers mostly densely hispid-ciliate; filaments dilated at insertion.

10. *M. androsaceus* Curran. Slender erect branching plant, $1\frac{1}{2}$ to 6 in. high; herbage slightly viscid-glandular; leaves obovate-

oblong, 3 to 6 lines long; pedicels nearly 1 to $1\frac{1}{2}$ in. long; calyx 3 lines long, in flower cylindric, broadening in age; teeth short, equal, triangular; corolla crimson, little bilabiate, 6 lines long or rather less.

First known from Tehachapi and since discovered at localities southward. Known in western middle California only from a fruiting specimen collected on Ben Lomond (Santa Cruz Co.), *Mrs. K. Brandegee*, Apr. 28, 1890.

11. *M. rubellus* Gray. Dwarf annual, 1 to $1\frac{1}{2}$ in. high; stem filiform, solitary from the rosulate tuft of radical leaves, or with one or two smaller stems, all naked below the somewhat corymbose inflorescence of two or three flowers; leaves ovate, 2 to $2\frac{1}{2}$ lines long; calyx 2 lines long $\frac{1}{2}$ as long as the funnelform corolla; corolla yellow, only slightly irregular.

On triturated rock amidst chaparral, La Jota Plateau, Howell Mountain, May 8, 1893; collected in western middle California only by the author; not uncommon in the Sierra Nevada, but usually much larger.

12. *M. latidens* Greene. Annual, glabrous, slender, erect and simple, or commonly with several ascending branches from the base, the internodes below the inflorescence very long; leaves sessile, ovate to ovate-lanceolate, remotely denticulate or entire, $\frac{1}{2}$ to 1 in. long; pedicels surpassing, often much surpassing the leaves, or the uppermost leaves reduced to bracts and the inflorescence subracemose; flowering calyx cylindric, 3 lines long or less; fruiting calyx ovate-campanulate; corolla nearly white or slightly yellowish, little exerted, the narrow limb almost regular; capsule oblong.—(*M. inconspicuus* Gray var. *latidens* Gray.)

Low wet fields: Sacramento Valley; Napa Valley; Antioch. Apr.—May. Basal leaves often subrosulate and petiolate. Herbage sometimes slightly viscid-puberulent.

13. *M. Langsdorffii* Donn var. *guttatus*. Annual, or perhaps sometimes perennial by the production of stolon-like stems at base; stems simple or sometimes branching, one to several from the base, about 1 to 2 ft. high; herbage glabrous or slightly pubescent; leaves more or less elliptical, thinnish, irregularly serrate or dentate, the lower petioled, the upper sessile; petioles mostly shorter than the blades; flowers in a terminal raceme; pedicels shorter than or equaling the flower; calyx in anthesis 3 to 5 lines long, in fruit somewhat longer and nearly or quite twice as broad; upper tooth of calyx the longer, often disposed to be approximate or connivent in age; corolla yellow, with purple or brown dots in throat, $\frac{3}{4}$ to 1 in. long.—(*M. guttatus* DC. *M. luteus* of Bot. Cal., etc.)

Sierra Nevada Mountains and high North Coast Ranges. Calyx often nodding in fruit, or borne on a pedicel recurving at apex. June–Aug. The type of *M. Langsdorffii* was collected on Unalaska, one of the Aleutian Islands. Forms of this species, in addition to the variety above described, abound in all parts of California and are highly interesting, exhibiting as they do great diversity within a

limited geographical area. The extremes of these forms are often very striking and some of these very pronounced varieties have been described as distinct species. Their continuance as such, however, can only be had by rigidly ignoring the equally interesting and multitudinous array of intermediate forms which, in their season, crowd the valley floors, hillsides, and cañons. A long series of intergrading specimens may be collected in favorable localities, such as Napa and Sonoma Valleys and the foothills and mountains adjacent. But it must be said, indeed, that a thorough examination of these forms has scarcely been begun. They have yet to receive that careful and prolonged study in the laboratory and field which their importance and biological interest alike demand. The following named varieties are wholly provisional but will be of some service to the field student.

Var. Californicum. Annual; 4 in. to 2 ft. high, simple or branching, stoutish; leaves round or roundish, often broader than long (as in all the following varieties, especially the sessile upper ones), dentate or sharply serrate, often with narrow salient lobes at base; flowers 1 to 1½ in. long.—Common in the Sacramento and Coast Range Valleys. Apr.—May.

Var. grandis Greene. Similar to the preceding but said to be perennial; stems fistulous, 2 to 3 ft. high; leaves ample (as much as 3½ in. long), on short petioles; flowers 1¼ to 2 in. long.—Rank form found along ditches and slow streamlets in the Bay Region. May–July.

Var. insignis Greene. Annual (as all the following), 6 to 20 in. high; foliage very scanty; lowest petioles long; corollas 1 to 1½ in. long, with a large purple splotch and several small purple dots on the lower lip.—Napa and Sonoma Valleys. Apr. One of the most showy plants of the genus.

Var. arvensis (*M. arvensis* Greene). Size of the preceding or larger; lower leaves often with several pairs of small leaflets near the main blade; floral leaves sometimes soft-villous; orifice of the mature calyx broad-campanulate, commonly truncate.—Wet fields: Howell Mountain and elsewhere.

Var. nasutus (*M. nasutus* and *glareosus* Greene). Teeth of the calyx in mature fruit often very strongly turned towards the upper one which is thrice the length of the others; corolla large or little surpassing the calyx.—Mountain rivulets and springs of the North Coast Ranges and doubtless elsewhere. Apr.—May.

14. **M. floribundus** Dougl. Annual; stems slender, at first erect, later diffuse, 5 to 15 in. long; herbage more or less slimy-viscid and musk-scented; leaves ovate, ½ to 1 in. long, dentate, short-petioled; pedicels mainly longer, sometimes shorter than the leaves; calyx narrowly campanulate (in fruit ovate), 2 to 3 lines long, the teeth ½ line long, hardly unequal; corolla light yellow, exceeding the calyx, mostly twice as long; capsule globose-ovate, obtuse.

Springy places and stream shores in the mountains: Sierra Nevada; Coast Ranges (but not reported from the Bay Region). May–June. There are dwarf forms 2 to 3 in. high.

15. **M. moschatus** Dougl. var. **sessilifolius** Gray. More or less villous, the whole plant wet as if with slimy dew, strongly musk-scented; stems weak, reclining, sometimes slender with long internodes, rooting at the nodes, 1 to 2 ft. long, from perennial creeping rootstocks; leaves sessile or shortly petioled, ovate, remotely dentate, about 2 in. long; flowers only in the upper axils; pedicels 1 to 2 in. long or more; calyx-teeth lanceolate, 2 to 3 lines long, nearly or quite $\frac{1}{2}$ the length of the tube, moderately unequal; corolla yellow, much exceeding the calyx, 1 in. long; capsule ovate, acute.—(M. inodorous Greene.)

Along streams and about springs in the mountains: seaward Coast Ranges (Santa Cruz Mountains; Marin Co.; and north and south along the coast); middle North Coast Ranges (Howell Mountain; Horse Mountain, Lake Co.); not reported from the inner Coast Ranges. June–Aug.

10. **MIMETANTHE** Greene.

Erect branching annual with long villous white hairs. Flowers small, yellow. Calyx short-campanulate, deeply 5-cleft, its tube slightly 5-sulcate, not prismatic-angled or even carinate. Corolla obscurely bilabiate, its lobes plane. Stamens 4, 2 fertile. Capsule pointed, loculicidal, dehiscent the whole length of the upper side and on the lower side along the apical attenuation; placentæ tardily separating, borne on the shortly 2-cleft valves. (Greek mimetes, an imitator, and anthos, blossom, on account of the resemblance to *Mimulus*.)

1. **M. pilosa** (Benth.) Greene. At length much branched, leafy, flowering from near the base, mostly about 8 to 10 in. high; herbage glandular-viscid and with disagreeable solanaceous odor; leaves lanceolate or narrowly oblong-ovate, entire, sessile; flowers on slender pedicels, the lower pedicels surpassing the leaves; upper tooth of calyx much longer than the others, equaling the tube; corolla bright yellow, its lower lobe usually with brown spots, slightly exceeding the calyx, 3 to 4 lines long; capsule oblong-ovate, attenuate.—(*Mimulus exilis* Durand.)

Moist stream and river beds: North Coast Ranges (Putah Creek, Lake Co., Russian River, etc.); South Coast Ranges; Sacramento and San Joaquin Valleys and southward. July–Sept.

11. **LIMOSELLA** L. MUDWORT.

Diminutive tufted annuals. Stems creeping in the mud (never ascending), bearing at intervals clusters of leaves and scapes. Leaves narrow, entire, fleshy. Scapes naked, 1-flowered. Calyx 5-toothed. Corolla nearly regular, open-campanulate, 5-cleft. Stamens 4, all fertile. Style short. Capsule globose, 2-celled only at base, many-seeded. (Latin *limus*, mud, and *sella*, seat, the species growing in moist localities.)

1. **L. aquatica** L. Tufts 1 to 1½ in. high; leaves exceeding the

scapes, narrowly oblong, 3 to 6 lines long, on long petioles (5 to 12 lines); corolla very small (less than 1 line long), white or purplish.

Muddy shores of ponds and lakes: San Mateo Co.; San Francisco; Point Reyes. June–July.

12. **MONNIERA** P. Br.

Perennial herbs with opposite leaves and solitary axillary flowers. Calyx of 5 almost distinct imbricated sepals, the upper broadest. Upper lip of the campanulate corolla emarginate or 2-lobed, the lower 3-lobed. Stamens 4, all fertile. Capsule thin, 2-valved, the valves 2-parted. Placentæ remaining united in the axis, the valves of the capsule separating from them. (L. G. C. Monnier, 1713–1799, Professor of Botany at Paris.)

1. **M. rotundifolia** Pursh var. **Eiseni**. Stems succulent, creeping, 10 to 14 in. long, villous-pubescent or almost glabrous; leaves rotund, sessile, flabellately many-nerved from the base, $\frac{1}{2}$ in. long; pedicels 1 or 2 in the axils, longer than the white flowers; corolla little irregular. — (*Herpestis Eiseni* Greene.)

Aquatic or in muddy situations: San Joaquin Valley (Stockton, *Sanford*, to Fresno, *Eisen*).

13. **GRATIOLA** L.

Low herbs with opposite sessile leaves and axillary 1-flowered peduncles. Calyx of 5 almost distinct nearly equal sepals. Corolla tubular; upper lip entire or bifid, the lower 3-cleft. Anther-bearing stamens 2, posterior; anterior pair consisting of sterile rudiments or wanting. Stigma dilated or with two flat lobes. Capsule 4-valved, the valves separating from the placenta-bearing axis. (Latin *gratia*, grace or esteem, in reference to its medicinal virtues.)

1. **G. ebracteata** Benth. Stems somewhat succulent, ascending, 2 to 3 in. high; herbage obscurely pubescent; leaves lanceolate, entire, $\frac{1}{2}$ in. long or less; peduncles longer than the flowers; sepals lanceolate, 4 lines long or less, equaling the yellow corolla and surpassing the globular and somewhat 4-angled capsule; sterile stamens wanting or represented by minute rudiments.

Wet soil in the north Coast Range valleys: Napa City, *Jepson*; Sonoma Valley, *Bioletti* (the only recorded localities within our limits), and far northward into Oregon.

14. **ILYSANTHES** Raf.

Small annuals with opposite sessile leaves. Flowers small, axillary, on filiform naked peduncles (or the upper becoming racemose). Calyx of 5 almost distinct sepals. Corolla tubular; upper lip short, erect, 2-cleft; lower lip larger, spreading, 3-cleft. Fertile stamens 2, posterior, inserted low down; anterior stamens sterile, inserted high in the throat, forked, one of the divisions glandular and obtuse, the other acute and sometimes bearing the rudiment of an anther. Stigma 2-lobed. Capsule many-seeded, septicidal or septicfragal. (Greek *ilus*, mud, and *anthos*, flower, the species a denizen of wet places.)

1. *I. gratioloides* Benth. Diffusely branching, 3 or 4 in. high, the stems and branches very slender; herbage glabrous; leaves ovate or oblong, 4 to 8 lines long, sparingly denticulate or entire; peduncles long and slender, several times longer than the flowers, solitary in the axils or subracemose above by the reduction of the subtending leaves to bracts; calyx 1 line long; corolla 3 to 4 lines long, bluish.

Muddy shores of the lower San Joaquin. Aug.—Sept.

15. *SYNTHYRIS* Benth.

Perennial herbs with the rounded petioled leaves in a radical tuft. Flowers racemose. Calyx 4-parted. Corolla with very short tube and 4-lobed rotate-campanulate limb. Stamens 2, inserted close to the upper sinuses, exserted. Anther cells parallel, not confluent. Capsule compressed, loculicidal. (Greek sun, together, and thuris, a little door, referring to the continued adherence of the base of the valves to the placentæ.)

1. *S. rotundifolia* Gray. Plants $2\frac{1}{2}$ to 5 in. high; herbage appressed-scrabulose; leaves ovate-cordate, doubly crenate, 2 in. long, shorter than the petioles; peduncles scarcely longer than the leaves; inflorescence loosely corymbose-racemose; the bracts small and the pedicels, at least the lower, several times longer than the flowers; corolla white, 2 lines long; capsule scarcely known.

Cataract Gulch, east slope of Bolinas Ridge, *Chesnut* and *Drew*, Apr. 17, 1891; *Cazadero*, *J. Burt Davy*, Mar., 1895; hills near Mad River, *Marshall*, Jan., 1887. Nearly related to *S. reniformis* Benth. of Oregon and Washington state; but that species is nearly glabrous, with reniform leaves shorter than the scapes, the pedicels very much shorter than the bluish flowers (which are disposed in a short dense raceme), and the capsule emarginate.

16. *VERONICA* L. SPEEDWELL.

Ours herbs with opposite leaves and flowers in axillary or terminal racemes, or solitary. Pedicels without bractlets. Calyx in ours 4-parted. Corolla subrotate, deeply 4-cleft, the upper lobe commonly broader than the lateral lobes or the lower one. Stamens 2, one on each side of the upper corolla-lobe, exserted. Stigma entire. Capsule flattened, often obcordate. Seeds few to many. (Name thought to be in memory of St. Veronica.)

Flowers solitary in the axils, the leaves alternate or the lowest opposite; annuals.

Diffuse plants; flowers blue; capsule with two strongly divergent lobes; fruiting pedicels $\frac{3}{4}$ to 1 in. long. 1. *V. Buxbaumii*.

Erect plants; flowers white; capsule obcordate, on pedicels $\frac{1}{2}$ to 1 line long. 2. *V. peregrina*.

Flowers in racemes in the axils of the opposite leaves; capsule rotund, not deeply or scarcely at all notched at apex. 3. *V. Americana*.

1. *V. Buxbaumii* Tenore. Stems branched from the base, $\frac{1}{2}$ to 1 ft. or more long, diffuse or procumbent; herbage pubescent with spreading hairs; leaves roundish or oval, often broader than long, 5 to 7 lines long, on petioles 1 line long, rather deeply toothed above the

base; flowers blue with a small white center, $2\frac{1}{2}$ to 3 lines broad; calyx-lobes ovate or oblong, 1 to $1\frac{1}{2}$ lines long; upper and lateral petals subequal, larger than the lower petal; capsule 4 lines broad, with two strongly divergent lobes, appearing as if twin; seeds about 9 in each cell, oblong or roundish, wrinkled, with a fissure on one side, 1 line long.

Escaped from gardens: abundant in alfalfa fields near Newark, *Miss Crocker*; Woodland, acc. to Brandegee. Apr. Another garden annual, *V. ARVENSIS* L., Corn Speedwell, is sometimes met with as an escape: pedicels shorter than the flowers; corolla blue, smaller; capsule notched at apex, the lobes not divergent.

2. *V. peregrina* L. NECKWEED. Annual, erect, 4 to 9 or 12 in. high, simple or branched from the base; herbage finely puberulent; leaves alternate or the lowest opposite, oblong, $\frac{3}{8}$ to 1 in. long, entire or dentate, only the lowest petioled; flowers solitary in the axils of the alternate leaves, sometimes in one of the axils of the opposite leaves, appearing racemose above by the reduction of the upper leaves to bracts; pedicels shorter than the small white flowers or obcordate capsules.

Common in low places in valley fields: Humboldt Co.; Ukiah; Napa Valley; South Coast Ranges; plains of the Sacramento and San Joaquin; Southern California. May.

3. *V. Americana* Schwein. BROOKLIME. Glabrous perennial; stems erect or ascending, 1 to 2 ft. long; leaves oblong-ovate, serrate, $1\frac{1}{2}$ to 3 in. long, short-petioled, bearing peduncled racemes in their axils; pedicels filiform, exceeding the linear-oblong bracts and much longer than the rotund capsule; corolla blue.

Springs and rivulets in the hills and mountains: Coast Ranges (Howell Mountain, Berkeley, San Francisco, Pajaro Hills); Sierra Nevada. June.

17. CASTILLEIA Mutis.

Root-parasitic herbs or sometimes suffrutescent plants. Leaves alternate, sessile, entire or more commonly lacinate. Flowers dull yellowish or greenish, in terminal spikes (rarely pediceled), the bracts and calyx-lobes commonly more showy than the corolla. Calyx tubular, flattened laterally, cleft before and usually behind, the divisions entire, emarginate or 2-cleft. Upper lip (galea) of the corolla long and narrow, flattened laterally (or conduplicate) and enclosing the style and the 4 unequal stamens. Lower lip very short, 3-lobed or -toothed. Anther cells unequal, the outer versatile, the inner pendulous. Capsule many-seeded. (D. Castillejo, Spanish botanist.)

Annual; calyx about equally cleft before and behind, wholly green; corolla straight, exserted from the calyx-tube and exposing the short scarlet lower lip. 1. *C. spiralis*.

Perennials.

Calyx much more deeply cleft before than behind; corolla falcate, the galea well exserted from lower side of calyx and exposing the lower lip. 2. *C. affinis*.

Calyx equally cleft before and behind; galea included or little exserted (the lower lip never exposed).

- Calyx-lobes mostly 2-cleft to middle; herbage villous-hirsute; leaves linear 3. *C. parviflora*.
 Calyx-lobes entire or with slightly 2-lobed summit.
 Herbage viscid-pubescent; leaves oval or obovate. 4. *C. latifolia*.
 Herbage white-woolly throughout; leaves linear. 5. *C. foliolosa*.

1. *C. spiralis*. Annual, erect, virgate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, the whole plant glandular-pubescent and wet as if with dew; leaves ascending, linear-lanceolate, $1\frac{1}{2}$ to 3 in. long, all entire; lower leaves with long linear tips, these coiling spirally when wilting; bracts entire, the uppermost with scarlet tips; lower flowers pedicellate; calyx equally cleft or cleft slightly deeper behind; calyx-lobes incisely 2-cleft at apex; corolla wholly green (except the lower lip) or sometimes slightly yellowish, straight, well-exserted from calyx-tube, exposing the bright scarlet teeth of the lower lip; corolla-tube longer than galea.

Moist rivulets, Butt's Cañon, northern Napa Co., July 13, 1897. *C. stanantha* Gray, to which this is closely allied, occurs from Monterey to San Diego and in the southern Sierra Nevada, and is the only other annual species in the state; it was first collected by Hartweg on the Carmel River.

2. *C. affinis* H. & A. SCARLET CUP. One to 2 ft. high, with few virgate branches from the base, rather leafy below; herbage nearly glabrous, somewhat villous, or slightly scabrous-puberulent; leaves linear, entire, 4 in. long or less; raceme loose below; bracts scarlet, 3-parted, the middle lobe largest and 3-cleft at apex; flowers pediceled, $1\frac{1}{4}$ in. long; calyx-lobes notched or 2-cleft at apex, the teeth acute; corolla yellowish, falcate, much exserted from the anterior cleft of the scarlet or scarlet-tipped calyx, and exposing the lower lip; galea about as long as tube, villous, bearded towards apex on the back.

Borders of woods in the Coast Ranges about San Francisco Bay: Oakland Hills; San Francisco; etc. Mar.-May. The large lower leaves have three strong callous nerves. Bracts very long, the lobes rather narrow, not broader above. Difficult to discriminate from the next; best known by its bright scarlet pediceled flowers, callous-nerved leaves, and the at length rather loose raceme.

3. *C. parviflora* Bong. var. *Douglasii*. INDIAN PAINT BRUSH. Stems from base rather few; herbage villous-hirsute; leaves linear, varying to linear-lanceolate or -oblong, entire or with a few linear-laciniate lobes, $1\frac{1}{2}$ to $2\frac{1}{2}$ (or the lower even $3\frac{1}{2}$) in. long; bracts petal-like above, equally 3-parted or the middle lobe somewhat larger and 3-cleft at summit; spikes lax below; calyx-lobes colored red, rarely yellow, laciniately 2-cleft at summit or to below the middle; corolla straight, the galea about as long as tube, little or not at all exserted.—(*C. Douglasii* Benth.)

Wooded cañons: Coast Ranges and Sierra Nevada. Common and variable. Bracts variable in color, tipped with red, yellow, or white. The bracts of the yellow form from the Oakland Hills are not cleft to the middle.

4. *C. latifolia* H. & A. SEASIDE PAINTED CUP. One-half to

1½ ft. high; herbage viscid-pubescent; leaves thick, oval or obovate, mostly less than 1 in. long, or the upper larger and 3-lobed at apex; bracts very short and broad (about 9 lines long and 5 lines wide) with oblong lobes, the middle lobe twice as large as the lateral; calyx-lobes broad, entire or notched at apex, almost equaling the corolla; corolla small, about 8 lines long; lower lip very short.

Sea cliffs and rocky headlands along the coast: San Francisco; Monterey, etc. Aug.

5. *C. foliolosa* H. & A. WOOLLY PAINTED CUP. Suffrutescent, with many stems from the base, mostly 10 to 18 in. high, white-woolly throughout; leaves linear and entire, rather crowded below and fasciated in the lower axils, about 1 in. long or less, the upper cauline and bracts 3-parted into linear lobes; bracts with lobes spatulate-dilated at apex, the middle lobe largest and shallowly 3-lobed; spikes dense; flower about 9 lines long, only slightly curved; galea protruding from calyx only 1 or 2 lines, shorter than or as long as tube of corolla; calyx-lobes truncate or merely retuse; capsule 7 lines long; seeds bluish green.

Dry Coast Range hills, mostly in rocky situations or on gravelly soil, in some places exceedingly abundant, occupying many acres of open hillside. Apr.-May.

18. ORTHOCARPUS Nutt. OWL'S CLOVER.

Annual herbs, or a few perennial species extra-limital. Leaves alternate, incised or laciniate, the floral sometimes colored. Calyx tubular or short-campanulate, 4-cleft, or cleft before and behind and the divisions 2-lobed. Corolla tubular, the upper lip ("galea") similar to that of *Castilleia*, but not so greatly (or not at all) exceeding the lower one. Lower lip 3-saccate, inflated, often very conspicuous. Stamens 4; anthers in some species with but one cell. (Greek orthos, upright, and karpos, fruit.)

Corolla with moderately 3-saccate lower lip, the teeth or lobes conspicuous; bracts with colored tips.

Filaments glabrous; galea nearly straight, glabrous.

Flowers whitish; spike slender, 3 in. long or more, lax below.

Flowers dull white with purple marks; spike short and dense, 2 in. long or less.

Flowers purple; spikes dense, cylindric.

Filaments hairy; galea hooked at apex, bearded; flowers crimson.

Corolla with conspicuously 3-saccate lower lip, much larger than the slender and straight (but often longer) galea; bracts wholly herbaceous.

Stamens in anthesis exerted from the slightly folded galea; flowers 6 lines long or less.

Plants small and weak; flowers scattered, inconspicuous, dark red.

Plants larger and more vigorous; flowers in mostly dense spikes, white or cream-color.

Stamens not exerted from the involute-subulate galea; flowers exceeding ½ in.

Leaves dissected into linear segments; tube of corolla filiform.

Herbage greenish; corolla yellow or pinkish white throughout.

7. *O. faucibarbatulus*.

Herbage somewhat reddish; galea purple.

Corolla deep sulphur-yellow. 8. *O. erianthus*.

Corolla white or rose-color: vars. of 8. *O. erianthus*.

Leaves broader, entire or with few segments; corolla-tube broader and dilated upwards; herbage somewhat yellowish; corolla cream-color throughout. 9. *O. lithospermoides*.

1. *O. attenuatus* Gray. Slender, strict or more rarely with a few branches, 5 to 12 in. high; leaves linear-lanceolate, attenuate, entire or the upper with one or two filiform lobes above the middle, 3 in. long or less, mostly 1 line wide or less; spikes slender, loose below, denser above; bracts with white tips or almost wholly herbaceous; calyx-lobes 4, filiform, the divisions of nearly equal depth; corolla dull white, not deeply bilabiate, the lanceolate teeth of the upper lip large for the size of the corolla, almost as long as the lower lip and nearly equaling the galea; lower lip shallowly saccate, purple-dotted.

Fields: Coast Ranges; Sacramento Valley; Sierra Foothills. Apr.-May.

2. *O. castilleioides* Benth. Corymbosely branched from the base, commonly 6 to 10 in. high, somewhat hirsute-pubescent; leaves broader than in the preceding, 4 lines wide or less, entire or with lacinate linear divisions; spikes short and dense, or even subcapitate, the bracts with white or yellowish tips; calyx-segments linear; corolla 6 to 10 lines long, dull white with purple marks; galea plainly longer than the bright crimson teeth.

Marshy ground about San Francisco Bay (Alameda, West Berkeley) and northward to Napa Valley and Sonoma Co. June.

3. *O. densiflorus* Benth. COMMON ESCOBITA. Strict or strictly branched, 5 to 15 in. high, finely pubescent; leaves oblong-lanceolate to linear, with mainly a pair of filiform divisions; spike dense, 4 in. long or less; bracts 3-cleft with purple and white tips; calyx-segments spatulate dilated, purple; corolla 8 to 10 lines long, purple and white; lower lip with large crimson dots, the teeth nearly as long as the galea.

Calistoga; San Rafael; Mill Valley; Newark, etc., and southward along the coast to San Luis Obispo. May.

4. *O. purpurascens* Benth. PURPLE ESCOBITA. Erect or frequently much branched from the base with ascending branches, 4 to 15 in. high, villous-pubescent; leaves parted into many filiform divisions; bracts palmately cleft and somewhat dilated, the upper with crimson or purple tips, as also the calyx-lobes; corolla crimson or purplish, 1 to 1½ in. long; lower lip white-tipped, with yellow and purple dots or markings; galea densely purple-bearded on the back, incurved at tip.

Sierra Foothills; Sacramento and San Joaquin Valleys; Napa Valley; Antioch; Los Gatos; Monterey and southward to Southern California. Apr.-May 15.

5. *O. pusillus* Benth. Slender and weak, 2 to 4 in. high; herbage purplish, sparingly hispidulous-pubescent; leaves pinnately cleft into linear or filiform divisions; bracts longer than the scattered inconspicuous dark red flowers; corolla 2 to 3 lines long.

Hillsides and fields, coloring moist spots with a dull red hue: Oakland Hills; Marin Co.; Humboldt Co. and northward. Mar.-Apr.

6. *O. floribundus* Benth. Erect, somewhat corymbosely branched from near the base or the middle, 5 to 12 in. high, nearly glabrous; leaves (especially the upper) pinnately parted into linear-filiform divisions, some again parted; spikes short and dense, the upper bracts not surpassing the calyx; corolla white or cream-color, 6 lines long, its tube much exceeding the calyx; lower lip with 2 hairy lines within.

Hillsides near the coast: Millbrae, *Davy*; San Francisco, *Jepson*.

7. *O. faucibaratus* Gray. Herbage greenish, glabrous, or puberulent above; 7 to 14 in. high, with ascending branches from the middle; leaves oblong or ligulate at base, pinnately cleft above into several linear divisions; spikes at length elongated and lax; bracts shorter than the flowers, palmately cleft or parted into lanceolate segments; corolla yellow or pinkish white throughout, 9 to 10 lines long, its tube very slender, pubescent, twice the length of the calyx; sacs of lower lip nearly 2 lines deep, deeper than high.

Low fields in the Coast Range valleys from Monterey Co., *Chandler*, Santa Cruz, *Setchell*, to Napa Valley, *Jepson*, Sonoma Co., and Mendocino Co. Apr.-May.

8. *O. erianthus* Benth. OWL'S CLOVER. Herbage, particularly the bracts and stems, reddish; plants 5 to 8 in. high; leaves pinnately divided into filiform divisions; spikes slender; bracts much shorter than the flowers; corolla about 10 lines long and sulphur-yellow except the dark purple subulate galea, its filiform tube at least twice the length of the calyx; sacs of the lip 2 lines deep, deeper than high, each sac commonly with 2 greenish yellow spots at the base of the tooth; folds of the throat densely bearded.

Very abundant on the plains of the Sacramento and San Joaquin and on the low hills of the Coast Ranges, often coloring wide stretches in Apr. and May.

Var. *versicolor* (*O. versicolor* Greene). WHITE OWL'S CLOVER. Corolla white, excepting the purple galea, often with a transverse purple band across the throat below the sacs; otherwise like the preceding.—Lake Merced.

Var. *roseus* Gray. Corolla rose-color.—San Francisco sand hills.

9. *O. lithospermoides* Benth. CREAM SACS. Herbage hirsute-pubescent above, less so below, erect and strict, or with few branches above the base; lower leaves lanceolate, entire; upper oblong, with a few slender lobes; spike very dense and thick; bracts nearly equaling the flowers, the upper dilated at the base, palmatifid into 7 or more narrow lobes; corolla 1 in. long or more, of a rich cream-color, strongly 3-saccate, the tube dilated upwards.

Plains and low hills: Contra Costa and Marin Cos. northward through the Coast Ranges to Mendocino; Sacramento Val'ey. Last of Apr. to first of June. Upper bracts large, almost as broad as long, concealing the calyx; in the two preceding species the upper bracts are small, little or not at all longer than the calyx, only 3 to 5-cleft and not so broad.

19. **ADENOSTEGIA** Benth.

Branching annuals. Leaves alternate, narrow, either entire or 3 to 5-parted into linear divisions. Bracts and calyx never colored. Flowers scattered along the branches or in terminal clusters or heads. Calyx spathe-like, consisting of an anterior and a posterior leaf-like division or the anterior division wanting. Corolla tubular, enlarged a little upwards, the lips of nearly equal length; lower lip obtusely 3-toothed. Stamens 4 or 2; anther-cells unequal, ciliate or minutely bearded. Capsule flattened; seeds with a loose coat, pointed at one end. (Greek *aden*, gland, and *stegē*, covering, some species glandular.)

Calyx diphyllous (*i. e.*, with anterior and posterior leaf-like divisions); stamens 4, filaments villous; bracts and floral leaves gland-tipped.

Flowers crowded into terminal heads; bracts hirsute-ciliate

1. *A. rigida*.

Flowers 2 or 3 together at the ends of the branchlets, or only one.

Herbage pubescent 2. *A. pilosa*.

Herbage glabrous 3. *A. Pringlei*.

Calyx monophyllous (*i. e.*, with a single posterior leaf-like division); filaments glabrous; bracts and floral leaves not gland-tipped.

Leaves entire; stamens 4 4. *A. maritima*.

Some of the leaves pinnatifid; stamens 2 5. *A. mollis*.

1. ***A. rigida*** Benth. Erect, paniculately branched, 1 to 2 or 3 ft. high; herbage finely puberulent, the 3-parted bracts hispid-ciliate; lower leaves entire, upper 3 to 5-parted into linear divisions, their tips dilated and retuse; flowers crowded in terminal heads; corolla yellowish and purplish, over $\frac{1}{2}$ in. long.

Throughout Southern California; recorded as within our limits only from Mt. Hamilton, *Greene*.

2. ***A. pilosa*** (Gray) *Greene*. Paniculately branched, 2 to 3 ft. high, glandular, soft-pubescent; leaves narrowly linear, entire, somewhat fascicled below, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the upper and floral with 3 callous-glandular teeth at the dilated tip; flowers 2 or 3 together at the end of the branchlets, or only 1; calyx-lobes exceeding the corolla; corolla $\frac{1}{2}$ in. long, dull white with some yellow markings; lower lip rather broad below, scarcely shorter than the upper; stamens 4; anthers 2-celled; filaments villous.—(*Cordylanthus pilosus* Gray.)

Very common on dry hills throughout northern California: Los Gatos; Moraga Valley; Napa Valley; Vaca Mountains and northward. Sept.

3. ***A. Pringlei*** (Gray) *Greene*. About $1\frac{1}{4}$ ft. high, diffusely and subdivaricately branched, the branches slender and very wiry; plants glabrous below, the inflorescence sparsely sprinkled with minute glandular-hispid hairs; leaves filiform, 6 lines long, the floral somewhat callous-tipped; flowers few, solitary, terminating the stem and branches; upper calyx-division narrow, bifid; corolla 5 to 6 lines long, white or greenish white, marked with purple at the middle; capsule oblique at summit, with a very distinct beak.

Mt. St. Helena, 3,700 to 3,900 ft.; first collected in Lake Co., by Pringle. The plant in anthesis is almost or quite leafless, and the rigid wiry branches of a deep brown or mahogany color are quite

characteristic. *This and the preceding species belong to the subgenus *Adenostegia* proper, characterized by a diphyllous calyx; it is to be noted, however, that the lower sepal in *A. Pringlei* and *A. pilosa* is deciduous, and that only the upper sepal persists in extreme age! The next two species are of the section *Hemistegia*, the calyx of which is monophyllous, only the upper sepal being present!

4. *A. maritima* (Nutt.) Greene. Corymbosely branched, 5 to 12 in. high; herbage glaucous and more or less hoary-pubescent; leaves linear to oblong, 1 in. long, entire; flowers in short rather thick spikes, about as long as the loosely imbricated bracts; corolla purplish; stamens 4, in very unequal pairs; anthers of the longer pair 2-celled, of the shorter pair with only the lower smaller cell; filaments glabrous.—(*Cordylanthus maritimus* Nutt.)

Salt marshes near the coast from San Francisco Bay southward to Southern California. July.

5. *A. mollis* (Gray) Greene. Simple or branched, $\frac{1}{2}$ to 1 ft. high, villous-pubescent, the bracts densely villous-hirsute; leaves linear or oblong, entire, or the upper saliently few-toothed or pinnatifid; flowers spicate; corolla $\frac{3}{4}$ in. long; stamens 2; anthers 2-celled; filaments glabrous.—(*Cordylanthus mollis* Gray.)

Interior salt marshes: Vallejo; Suisun Marshes. Aug.

20. PEDICULARIS L. LOUSEWORT.

Perennial herbs with alternate pinnatifid leaves. Flowers in a bracteate spike. Calyx 2 to 5-cleft. Corolla tubular, strongly bilabiate; upper lip galeate, arched and compressed; lower lip of 3 small rounded lobes or teeth. Stamens 4, under the galea; anthers transverse, with equal cells. Capsule flattened, oblique at apex, loculicidally 2-valved. (From Latin *pediculus*, a louse; of uncertain application.)

1. *P. densiflora* Benth. INDIAN WARRIOR. Stems simple and erect, 9 to 12 in. high, commonly several from the scaly caudex; herbage soft-pubescent or nearly glabrous; leaves pinnately divided or parted, the segments oblong and doubly serrate-toothed or incised; flowers in a terminal dense (or in age loose) spike; bracts linear, ciliate or serrulate towards the apex, mostly shorter than the flowers; calyx 5-angled, the anterior and lateral angles soft-pubescent, equally or unequally 5-toothed, 3 to 4 lines long; corolla crimson, 1 in. long or more; galea large, slightly broader upwards, strongly arched; lower lip small, of 3 rounded teeth; anther-cells acute at base; seeds few.

Wooded hills throughout western California. Feb.—Mar.

BELLARDIA TRIXAGO (L.) is an escape near Martinez, acc. to Greene, Man., 284. It is an annual with crenate-serrate lanceolate leaves, red and white flowers in a dense terminal spike, 4-lobed calyx, and the lip of the corolla equaling or exceeding the galea.

87. **PLANTAGINACEÆ.** **PLANTAGO** FAMILY.

Acaulescent herbs with 1 to several-ribbed or -nerved radical leaves. Flowers regular, 4-merous, the scarious and veinless corolla commonly withering-persistent. Ovary 2 to 4-celled, superior; style long-stigmatose, simple and filiform.

1. **PLANTAGO** L. **PLANTAIN.**

Flowers perfect or polygamo-diœcious, each subtended by a bract, disposed in spikes or heads which are raised on a leafless scape. Sepals 4. Corolla small, salverform, with a short tube, or nearly rotate. Stamens 4, or sometimes 2, alternating with the lobes of the corolla and borne on its tube. Ovary 2 or falsely 4-celled, with 1 or more ovules in each cell. Capsule circumscissile, the seeds attached to the face of the loose partition which falls away with the lid. Seed-coat mucilaginous. (Latin name of the Plantain.)

Corolla closed over the mature capsule, forming a sort of beak; perennial; stamens 4; spike 6 to 12 in. long; leaves oblong-lanceolate.

1. *P. hirtella*.

Corolla remaining expanded, not closed over the mature capsules.

Perennials; stamens 4.

Leaves lanceolate 2. *P. lanceolata*.

Leaves ovate 3. *P. major*.

Leaves linear 4. *P. maritima*.

Annuals; leaves linear or oblanceolate.

Stamens 4; capsule 2-seeded, spike oblong; vars. of . . . 5. *P. Patagonica*.

Stamens 2; capsule 4-seeded, spike narrowly linear . . . 6. *P. Bigelovii*.

1. *P. hirtella* HBK. Root thick; herbage roughish pubescent, especially the scapes and leaf-ribs; leaves oblong-oblanceolate to narrowly oblong, tapering to apex and below into a broad petiole, 3 to 12 in. long and $\frac{3}{8}$ to $3\frac{3}{4}$ in. wide; spikes 6 to 12 in. long, dense except at the base; corolla persistent, its lobes closed over the capsule, forming a sort of beak; seeds 3.

Clay banks along the coast: Santa Cruz (?); San Francisco; Berkeley; Tennessee Bay, Marin Co.; Bolinas; Dillons Beach, acc. to *Setchell*.

2. *P. lanceolata* L. RIBWORT. ENGLISH PLANTAIN. Perennial; herbage somewhat villous with short hairs, often rusty-pilose; leaves erect or spreading, oblong-lanceolate, tapering at base into a slender petiole, strongly 3 to 5-ribbed, $3\frac{1}{2}$ to 6 in. long; scape longer than the leaves, sulcate and angular, erect; spike short-cylindrical, $\frac{3}{4}$ to 2 in. long; corolla nearly rotate; sepals scarious, the two lower often combined into one; stamens twice as long as the corolla, with slender filaments; capsule 2-seeded.

Common about San Francisco Bay, flowering from Apr. until late summer.

3. *P. major* L. COMMON PLANTAIN. Glabrous perennial; root-stock short and thick; leaf-blades round-ovate, 3 to 6 in. long, entire or toothed, marked with 5 to 7 prominent ribs, these converging at the base into a broad petiole 4 or 5 in. long; peduncles not as long as the leaves, rarely longer, bearing an elongated spike often 8 in.

long; sepals green in the middle, with scarious edges; capsule 2-celled with 4 to 8 seeds in each cell, circumscissile near the middle.

Not uncommon in low fields and waste places. The species is probably introduced from Europe. Called by the Indians "White Man's Foot," since it has closely followed the advance of civilization, springing up about the earliest frontier settlements. It has repute in rustic medicine for the cure of certain cutaneous disorders.

Var. Asiatica Dec. Leaves in a rosette-like cluster, the petiole about 1 in. long or less; peduncles surpassing the leaves; spike below less dense; capsule circumscissile near the base and well within the calyx.—Stockton; Sierra Nevada.

4. **P. maritima** L. SEA PLANTAIN. Low stout maritime perennials with many thick and fleshy linear or narrowly linear leaves; peduncles ascending, 3 to 4, rarely 6 to 7 in. long, equaling or exceeding the leaves; spike cylindrical, $1\frac{1}{4}$ to 2 or 3 in. long; sepals somewhat carinate; corolla-tube pubescent externally; capsules 2 to 4-seeded.

Cliffs and rocks near the sea: Santa Cruz; San Francisco; West Berkeley.

5. **P. Patagonica** Jacq. var. **Californica** Greene. Annual, silky-pubescent, 4 to 5 in. high; leaves narrowly linear to oblanceolate, about $\frac{2}{3}$ the length of the scapes, rarely equaling them, less than 1 to nearly 3 lines wide; spike dense and short, oblong, or even almost capitate, 4 to 6 lines long; sepals obtuse, with a firm and broadly linear central portion, this scariously margined; capsule 2-seeded; seeds oblong-oval with a pronounced ventral sulcus, and tough leathery testa.

Very common on hillsides everywhere. Apr.—May. Fr. June.

Var. rosulata (*Plantago Californica* Greene). Rosulate leaves mostly depressed, the scapes somewhat decumbent at base, twice the length of the leaves.—Contra Costa Co. southward in the Mt. Diablo Range.

6. **P. Bigelovii** Gray. Slender annual, 3 to 5 in. high; leaves linear or filiform, commonly shorter than the scapes, less than 2 lines broad, both scapes and leaves erect; fruiting spike $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, about $1\frac{1}{2}$ lines wide; stamens 2; capsule ovoid-oblong, 1 to $1\frac{1}{2}$ lines long, circumscissile much below the middle (well within the calyx), 4-seeded, occasionally a fifth seed; seeds winged at one end.

Alkaline fields of the Sacramento and San Joaquin Valleys westward to the Potrero San Pablo, *Davy*, and Hollister, *Setchell*. Apr.—May.

88. UTRICULARIACEÆ. BLADDERWORT FAMILY.

Aquatic insectivorous plants. Calyx bilabiate. Corolla deeply bilabiate, the lower lip larger, 3-lobed, spurred at the base in front. Stamens 2, anterior. Ovary 1-celled, with free central placenta bearing several ovules. Fruit a 2-valved capsule. Seed with a straight embryo and no endosperm.

1. **UTRICULARIA** L. BLADDERWORT.

Leaves capillary divided and bearing little bladders which possess a kind of valve-like opening. Scapes 1 to few-flowered. Calyx-lips entire. Corolla with a projecting palate on the lower lip, often closing the throat; upper lip erect. (Latin *utriculus*, a little skin or leathern bottle.)

1. **U. vulgaris** L. COMMON BLADDERWORT. Immersed stems 1 ft. long or more, crowded with bi- or tri-pinnately parted leaves bearing many bladders; scapes 5 to 12-flowered; pedicels recurved in fruit; corolla 6 to 9 lines broad, with conical spur somewhat shorter than the lower lip.

Olema, *Mrs. K. Brandegee*; Suisun Marshes(?); Lower San Joaquin, *Mrs. K. Brandegee*. The bladders have an entrance closed by a valve opening inwards, so that small aquatic animals having entered are unable to escape.

89. **OROBANCHACEÆ.** BROOM-RAPE FAMILY.

Root-parasitic herbs, destitute of green color, with alternate scales in place of leaves. Calyx persistent. Corolla tubular, more or less bilabiate, the upper lip 2-lobed or entire, the lower 3-lobed. Stamens 4, didynamous, inserted on the tube of the corolla. Ovary free, 1-celled, pointed with a long style which is curved at the apex. Capsule ovoid, 2 to 4-valved, each valve bearing on its face 1 or 2 placentæ. Seeds numerous, very small, with endosperm; embryo minute.

Calyx 5-cleft; anther-cells separated from below upward, mucronate at base; capsule 2-valved 1. **APHYLLON**.

Calyx truncate behind and before, or with 1 to 4 teeth in front; anther-cells parallel, blunt; capsule 4-valved 2. **BOSCHNIAKIA**.

1. **APHYLLON** Mitch. BROOM-RAPE.

Low commonly viscid-pubescent plants, with violet-purple or yellow flowers. Calyx 5-cleft into acute or acuminate lobes. Corolla tubular, curved, obscurely or manifestly bilabiate; upper lip erect or arching inwards, in ours 2-lobed; lower lip 3-lobed, spreading. Stamens included. Style deciduous; stigma peltate or with anterior and posterior lobes. Placentæ 4, 2 on each valve of the capsule. (Greek prefix *a*, without, and *phyllon*, leaf.)

Flowers on long slender peduncles from a short more or less subterranean caudex, without bractlets; corolla obscurely bilabiate; placentæ not closely approximate in pairs.

Peduncles few or one; corolla bluish or purplish; calyx-lobes subulate . .

1. *A. uniflorum*.

Peduncles many; corolla commonly yellow; calyx-lobes broader

2. *A. fasciculatum*.

Flowers in a raceme, or subspicate, or thyrsoid; flowers with 2 bractlets; corolla manifestly bilabiate; placentæ in contiguous pairs.

Herbage light colored or somewhat purplish; flowers pedicellate; calyx equally cleft.

Calyx-lobes nearly as long as tube of corolla. 3. *A. comosum*.

Calyx-lobes scarcely half as long as corolla. 4. *A. Californicum*.

Herbage dark reddish brown; flowers subsessile or short pediceled; calyx unequally cleft; stems with a thickened tuber-like base
5. *A. tuberosum*.

1. *A. uniflorum* (L.) Gray. NAKED BROOM-RAPE. Peduncles few or one, slender, $1\frac{1}{2}$ to $5\frac{1}{2}$ in. high, from a short scaly nearly subterranean stem; calyx-lobes subulate, often attenuate, longer than the tube; corolla violet-tinged or blue-purple, 1 in. long or less (twice the length of the calyx or more), the lobes obovate and rather large.

Widely distributed but not common: Lafayette, Contra Costa Co.; Milliken Cañon near Napa. Apr.-May.

2. *A. fasciculatum* (Nutt.) Gray. Scaly stem emerging from the ground 1 or 2 in. and bearing numerous fascicled peduncles 3 to 4 in. long; plants more pubescent and glandular than in no. 1; calyx-lobes broadly or triangular-subulate, usually shorter than but often exceeding the tube; corolla yellow, sometimes purple or reddish-tinted, 1 to $1\frac{1}{2}$ in. long.

Higher mountain slopes and ridges, rather common: Coast Ranges (Vaca Mountains, Mt. Tamalpais, Mt. Diablo, Mt. Oso, etc.); Sierra Nevada; Southern California. June. Parasitic on *Eriogonum*, *Phacelia*, *Artemisia*, etc.

3. *A. comosum* (Hook.) Gray. Branching close to the surface of the ground, 3 to 4 in. high, puberulent; flowers racemose or somewhat corymbose; pedicels 2 to 4 lines long; bractlets on the pedicels or at the base of the flowers; calyx parted into long linear-attenuate lobes $\frac{2}{3}$ as long as or nearly equaling the corolla; corolla pinkish or purplish, 1 to $1\frac{1}{2}$ in. long, upper lip notched or bifid, lower 3-parted into rather narrow lobes; anthers woolly.

Dry hills, parasitic on *Artemisia* and other shrubs, not common. Mohave Desert northward to Washington: Mt. Oso, Stanislaus Co., *Brewer*; Livermore, on *Sambucus glauca*, *Dr. W. A. Hammond*, the specimens nearly a foot long and the main stem 1 in. thick; bractlets somewhat remote from the calyx; very abundant in "the low overflowed lands between the San Joaquin River and Paradise Cut." *Brandegee*. Aug.-Sept.

4. *A. Californicum* (C. & S.) Gray. Viscid-pubescent, with usually simple stems 2 to 6 in. high; flowers crowded in a dense raceme; pedicels 1 to 2 (or the lower sometimes 6) lines long; calyx-segments linear-lanceolate, half as long as the corolla; corolla yellowish or purplish, $\frac{7}{8}$ to 1 in. long, its lobes shorter and less spreading than in no. 3; anthers glabrous or slightly hairy.

Open hills: Coast Ranges; Sierra Nevada. Corolla rather more slender and less membranaceous than in *A. comosum*; lips about 2 lines long, in *A. comosum* about 3 to 4 lines long.

5. *A. tuberosum* Gray. Low, stout, pruinose-puberulent, the thickened base of the stem with imbricated scales; inflorescence a dense pyramidal (or more or less globose) cluster of short racemes; calyx unequally cleft, the lobes about as long as the tube of the corolla; corolla yellowish or dark purple or brown, 5 to 7 lines long,

the lobes a line long, scarcely spreading; anthers after dehiscence somewhat hairy.

Summits of the Coast Range peaks and ridges: Gabilan Mountains, *Brewer*; Mt. Hamilton, *Greene*; Mt. Diablo, *Kellogg*; Mt. Tamalpais, *Miss Eastwood*; Vaca Mountains, *Jepson*, parasitic on *Adenostoma fasciculatum*, the dark red or dark brown thyrsoïd-congested inflorescences 2 in. thick or more, looking at first glance not unlike small burnt stumps where fire has passed through the Chamisal; Snow Mt., Lake Co., *Brandege*. May.

2. BOSCHNIAKIA C. A. Mey.

Stems thick, simple, arising from rather large globose tubers which are developed at the point of attachment of the parasite to the root of the host plant. Flowers without bractlets, sessile or pedicellate, more or less concealed by scaly subtending bracts, the whole forming a dense spike. Calyx short, cup-shaped, truncate behind and with teeth in front, or entirely truncate. Corolla ventricose; upper lip erect or fornicate, entire or bifid; lower 3-parted. Stamens slightly exerted. Stigma bilamellar, the lobes right and left, or 4-lobed. Capsule 4-valved, each valve with 1 placenta. (*Boschniaki*, a Russian botanist.)

1. *B. strobilacea* Gray. Tubers 2 to 3 in. in diameter, bearing 1 to 6 spikes; spikes deep red-brown in age; scales much imbricated, very broad and obtuse; calyces truncate or with 1 to 4 teeth anteriorly and laterally disposed; upper lip of corolla entire, emarginate or bifid; filaments densely bearded at base.

Higher Coast Range ridges (Santa Cruz Mountains, Oakland Hills, Mt. Tamalpais, Mt. St. Helena), northward to British Columbia; commonly parasitic on the roots of *Manzanita*. May. The oblong spikes in many cases bear a marked resemblance to Sugar Pine cones; in other cases the inflorescence is more open and the specific name less applicable. Lower flowers rarely with bractlets. For a detailed account of this peculiar parasite see *Erythea*, v. 63, pl. 1 & 2.

90. POLEMONIACEÆ. GILIA FAMILY.

Herbs or a few species slightly suffrutescent. Leaves alternate or opposite, entire, lobed or divided. Flowers complete, 5-merous except that the superior ovary is 3-celled, either solitary, in loose clusters, capitate, racemose, corymbose or paniculate. Calyx persistent, in one subgenus irregular. Corolla regular, convolute in the bud. Stamens inserted on corolla, alternate with its lobes, often unequal in length. Style 3-cleft. Capsule loculicidally 3-valved. One species of *Gilia* has a 4-merous corolla and some exceptions as to the capsule are noted under that genus.

Calyx herbaceous throughout; filaments hairy at base; leaves alternate, pinnate. 1. *POLEMONIUM*.
Calyx more or less scarious below the sinuses, at least not herbaceous throughout.

Sinuses of the calyx in age distended into a revolute lobe. 2. *COLLOMIA*.

Sinuses of the calyx not distended.

Leaves alternate in ours except one species, entire or pinnately toothed, lobed or divided. 3. *GILIA*.

Leaves opposite, palmately divided in ours, rarely entire 4. *LINANTHUS*.

1. *POLEMONIUM* L. JACOB'S LADDER.

Perennials. Leaves alternate, pinnate, the leaflets sessile. Flowers showy, blue or white, in racemes, thyrses or panicles. Calyx herbaceous throughout, not scarious below the sinuses, accrescent. Corolla from funnellform to nearly rotate. Filaments more or less declined and hairy at base. Seeds few or several in each cell. (Greek name used by Dioscorides, from *polemos*, war, the application not obvious.)

1. *P. carneum* Gray. Lightly pubescent, 1 to 2 ft. high, the stems lax or diffusely branching; leaflets thin, 7 to 17, ovate to ovate-lanceolate, 1 to $1\frac{1}{2}$ in. long, all but the terminal distinct, these sometimes confluent; flowers corymbose-paniculate on rather slender pedicels; calyx about 4 lines long, accrescent in age and twice as long; corolla broadly funnellform, salmon-color to purple, 8 to 12 lines long, the limb nearly as broad when expanded; lobes obovate and either acute or obtuse; stamens and style included; seeds 3 or 4 in each cell.

Rare but handsome species of mountain woods: Pilarcitos, San Mateo Co.; Marin Co.; northward to Siskiyou Co., where first collected by Greene. Apr.-May.

2. *COLLOMIA* Nutt.

Herbs, ours annual, with alternate leaves. Flowers in ours in dense clusters with foliaceous bracts. Calyx turbinate, in age obpyramidal or cup-shaped, its teeth or lobes equal, entire, erect, the sinuses in age distended into a recurved lobe. Corolla narrowly funnellform or salverform, salmon-yellow, reddish, purple, or white. Stamens unequal and unequally inserted on the tube of the corolla, mostly straight. Seed 1 in each cell, the seed-coat developing spiral threads when wet. Capsule oval to obovoid. (Greek *kolla*, glue, on account of the mucilaginous seeds.)

Corolla narrowly funnellform, pale salmon-color; leaves entire. 1. *C. grandiflora*.

Corolla salverform, red-purple; leaves more or less bipinnatifid or simply toothed or entire. 2. *C. heterophylla*.

1. *C. grandiflora* Dougl. Erect, simple, $\frac{2}{3}$ to 2 ft. high; leaves alternate, linear or oblong-lanceolate, entire, sessile; flowers crowded in head-like clusters at the ends of the stems and leafy-bracted, or some often borne below, either singly in the axils or in small clusters on short branchlets; calyx-tube obconical, its lobes broad and obtuse; corolla pale salmon-color, narrowly funnellform, 1 in. long, its tube thrice as long as the calyx, its lobes broadly oblong; valves of the capsule after dehiscence with the sides strongly reflexed.

Common in the Sierra Nevada at middle altitudes; occurring in the Coast Ranges, at the higher altitudes, but rarely collected (Mt. Hamilton, acc. to Davy). July.

2. **C. heterophylla** Hook. Plants low and erect, or diffusely branching and the stems 1 ft. long; herbage more or less viscid-pubescent; leaves thin, the upper entire or toothed, the lower pinnately cleft or pinnately divided and the broad segments laciniately cleft; flowers in small bracted clusters at the ends of the branches; corolla red-purple, small, 4 to 5 lines long, the limb 1 line broad; capsule ellipsoid; seeds 2 or 3 in each cell.

Shady places in the mountains: Coast Ranges (Marin Co., Napa Co.); Sierra Nevada. Mar.-Apr.

3. **GILIA** R. & P.

Herbs, ours annuals except *G. densifolia*. Leaves alternate (except *G. gracilis*), entire or pinnately toothed, lobed, or divided. Calyx-tube scarious below the sinuses. Corolla funnelform to salverform, blue, yellow, or white, the stamens equally inserted on its throat except a few species. Capsule 3-celled and 3-valved, or (in 2 species of the subgenus *Navarretia*) 1-celled and 4-valved. (Felipe Luis Gil, Spanish botanist of the latter half of the 18th century.)

Calyx-segments equal, entire; flowers solitary, in loose or capitate clusters, or paniculate, bracted or bractless; stamens equally or unequally inserted on throat of corolla; leaves in ours mostly flaccid, not pungent or prickly.—Subgenus *EUGILIA*.

Leaves opposite and entire; corolla salverform, its tube little surpassing calyx, its throat yellow and limb purple 1. *G. gracilis*.

Leaves alternate.

Leaves pinnatifid or pinnately lobed, the upper usually palmately parted into 3 to 5 divisions; corolla funnelform, its tube 2 to 3 times longer than the calyx 2. *G. giliioides*.

Leaves mostly 1 to 3 times pinnately dissected into narrow segments, not pungent; flower-clusters not bracteate; calyx-teeth equal; corolla funnelform.

Stamens included; flowers few in mostly loose clusters.

Flowers blue or purple; proper tube of corolla much shorter than calyx; leaves pinnately parted into entire or toothed lobes. 3. *G. multicaulis*.

Flowers 3-colored, blue, purple, and yellow; leaves laciniately bipinnatifid 4. *G. tricolor*.

Stamens more or less obviously exserted; flowers in capitate clusters terminating long peduncles.

Corolla segments obovate or oblong 5. *G. achilleaefolia*.

Corolla segments nearly linear 6. *G. capitata*.

Leaves or their simple divisions linear or filiform and rigid; flowers crowded into capitate leafy-bracted clusters, the calyces and the bracts densely woolly-matted; corolla salverform; stamens exserted.

Annual or biennial, not woody; var. *floribunda* of 7. *G. virgata*.

Woody-based perennial; corolla 6 to 8 lines long 8. *G. densifolia*.

Calyx-segments mostly unequal, entire or some toothed or cleft; flowers in terminal capitate bracted clusters; corolla tubular-funnelform or salverform, the stamens equally inserted upon it; leaves pinnatifid or the lowest subentire, the segments mostly rigid and subulate or cuspidate.—Subgenus *NAVARRETTIA*.

Capsule not regularly dehiscent, the walls thin and transparent and closely covering the seeds which are agglutinated into a mass; flowers white (pale blue in no. 11).

Stems erect or spreading.

- Bracts densely white-tomentose; leaves bipinnatifid 9. *G. intertexta*.
- Sinuses of the calyx white-hairy; leaves once pinnatifid 10. *G. leucocephala*.
- Primary flower-cluster on a very short stem or almost none, the branches radiating from beneath it and prostrate; calyx-segments trifid 11. *G. prostrata*.
- Capsule regularly dehiscent by valves and releasing the seeds which are free from each other; flowers blue (except no. 14).
- Leaves (or some of them) pinnately parted with the divisions incised or parted.
- Stamens exserted; capsule 1-celled.
- Leaves with innocuous teeth; flowers creamy white, 4-merous 12. *G. cotulaefolia*.
- Leaves with pungent teeth, the terminal leaflet spatulate-dilated; capsule 1-seeded 13. *G. pubescens*.
- Stamens not exserted.
- Seeds 8 to 12 in each cell; herbage strongly mephitic-scented 14. *G. squarrosa*.
- Seeds 4 in each cell; herbage honey-scented 15. *G. mellita*.
- Leaves merely pinnatifid or incised or many of them entire.
- Capsule several-seeded.
- Erect slender plants; bractlets laciniately cleft, especially toward the base 16. *G. heterodoxa*.
- Low very rigid and spiny plants; bractlets dilated and with strong marginal spines 17. *G. atractyloides*.
- Cells of capsule 1-seeded; corolla 6 or 7 lines long; bractlets, especially the inner ones, lanceolate-cleft at apex 18. *G. viscidula*.

1. *G. gracilis* Hook. Three to 8 in. high, either simple or branched above; herbage pilose-pubescent, the hairs often gland-tipped; leaves opposite, oblong to lanceolate, entire; inflorescence cymose and terminal; calyx cylindrical, 3 or 4 lines long, much distended in fruit by the globose capsule, the short teeth accrescent; tube of corolla yellow, surpassing the calyx, the limb 1 to 1½ lines broad, its lobes roundish, emarginate; stamens unequally inserted; seeds 1 in each cell, with a rather broad thin margin.—(*Collomia gracilis* Dougl. *Microsteris Californica* Greene.)

Inconspicuous but rather common on low hills of the Coast Ranges and in the Sierra Foothills. Mar.—Apr.

2. *G. gilioides* (Benth.) Greene. Loosely branching, erect or diffuse, 8 to 20 in. high; radical and lower leaves pinnately parted into narrowly oblong or lanceolate divisions, or all so divided, or the upper palmately divided into 3 to 5 obovate or lanceolate divisions; corolla 4 to 6 lines long, salverform, blue-purple; stamens unequally inserted; capsule globose; seeds 1 or 2 in each cell.—(*Collomia gilioides* Benth.)

Mostly at higher altitudes in the mountains: Coast Ranges; Sierra Nevada; Southern California. June. Leaves exceedingly variable.

3. *G. multicaulis* Benth. Branching from the base, 9 to 14 in. high, glabrous; leaves pinnately parted into 5 to 9 linear and entire or toothed lobes; flowers subsessile or the clusters loose, in either case few-flowered, the pedicels 1 to 4 lines (rarely 1 in.) long; calyx-teeth erect or recurved in fruit; corolla deep or pale blue, its proper tube shorter than the calyx, the funnelform throat longer than the obovate lobes; stamens unequally inserted; capsule ovoid.

Hills and valleys from Marin Co. and the Vaca Mountains southward through the Coast Ranges to Southern California.

G. LATIFLORA Gray is a similar species of Southern California; glabrous except the loosely paniculate inflorescence; radical leaves pinnatifid, the cauline few, narrow and entire; pedicels shorter than the flowers or 1 in. or more long; corolla dilated-funnelform, abruptly contracted below into a narrow tube which slightly exceeds the calyx; calyx less than 2 lines long, with subulate or acute teeth.—Specimens seemingly referable to this come from Coyote Creek, Santa Clara Co.

4. G. tricolor Benth. **BIRD'S EYES.** Erect, usually branching somewhat above the base, commonly 4 to 7 in. or sometimes 1 ft. high; herbage more or less pubescent with gland-tipped hairs; leaves laciniately bipinnatifid into narrowly linear divisions; calyx 3 lines long, its lobes acuminate; corolla 6 to 7 lines long, the roundish lobes azure or whitish, the throat with 2 oblong purple areas beneath each lobe bounded below by yellow; stamens inserted at the sinuses.

Common on low hills: Coast Ranges (Los Gatos, northward to Humboldt Co., but especially common toward the interior); Sierra Foothills. Apr.

5. G. achilleæfolia Benth. Very similar to the next in habit but very frequently simple, generally more pubescent, and the capitate flower-clusters larger and less compact; calyx more or less woolly, the teeth triangular, acute, with short recurved tips or connivent over the young fruit; corolla funnelform with ample throat, deep or pale blue, its lobes obovate or oblong.

Sandy soils: Coast Ranges; Sierra Foothills; Southern California. May.

6. G. capitata Dougl. Erect, simple or more commonly branching above, 2 or 3 ft. high, pubescent or almost glabrous; leaves several times palmately dissected into linear or filiform lobes, or the uppermost merely pinnately divided; ultimate segments often curved or falcate; peduncles long, slender and naked, terminating in a densely capitate or globose cluster; calyx nearly or quite glabrous, its teeth lanceolate, in anthesis approximating the tube in length; corolla light blue, its lobes nearly linear; stamens inserted in the very sinuses of the corolla.

Coast Range hills and ridges from Marin and Napa Cos. northward; Sierra Nevada. May.

7. G. virgata Steud. var. **floribunda** Gray. Stems simple or branching at the base; leaves pinnately parted into 3 to 7 filiform lobes, the middle (or terminal) lobe commonly much longer than the others; flowers numerous in head-like clusters terminating the corymbose branches, the bracts and calyx very densely woolly; corolla salverform, the tube 6 to 8 lines long and surpassing the acerose calyx-lobes; filaments filiform and exserted.

Sandy soils of the valleys: Lower San Joaquin and Santa Clara Co., southward to Southern California. June–July. **GILIA VIRGATA** has the lower leaves entire, the upper rarely more than 3-parted, with the clusters virgately disposed.—Monterey and southward.

8. *G. densifolia* Benth. Perennial; stems numerous from a tufted woody base, 8 to 14 in. high; herbage lanate-tomentose when young, glabrate in age; leaves narrowly linear and entire or with 1 or 2 pairs of short-subulate spinulose lobes at the middle or toward the base; flower-clusters terminal, dense, the foliaceous bracts and the calyces implexed-woolly; four of the calyx-teeth short, the fifth as long as the tube; corolla deep blue, the tube 6 lines long, 2 or 3 times the length of the calyx, its lobes oblong, about 2 lines long.

Mountains of Santa Clara Co. and southward to Southern California. June–Sept.

9. *G. intertexta* Steud. Stems simple or often branching from the base, 2 or 3 to 7 in. high, white-puberulent but not glandular; leaves bipinnatifid and the segments spinescent-tipped; body of bracts and exterior of calyx-tube densely white-villous or woolly-tomentose; corolla white or pale blue, equaled by the calyx-teeth.

Valleys and low hills: North Coast Ranges (Humboldt Co., Healdsburg, Conn Valley, Calistoga, etc.); Sacramento and San Joaquin Valleys. May–June.

10. *G. leucocephala* Benth. Stems simple or branching from the base, 3 to 5 in. high, whitish-puberulent; leaves pinnately parted, the divisions filiform and entire, sparingly toothed, the rachis broad and often prolonged into an elongated terminal entire division; flowers clear white, 4 lines long; calyx with a tuft of hairs at each sinus, the teeth mostly entire and nearly equal.

Low places in fields and beds of pools where water has stood in winter or early spring, the plants often growing very densely: Sacramento Valley; Vacaville; Winters; first collected on plains near the Feather River by Hartweg. May–June.

11. *G. prostrata* Gray. Plants glabrous; primary flower-cluster sessile, the branches radiating from beneath it, simple or once forked, terminating in the head-like clusters; leaves pinnatifid, the rachis broad and slender, the segments remote; heads dense, surrounded by foliaceous bracts 1 to $1\frac{1}{2}$ in. long; bractlets not exceeding the white flowers; corolla-lobes oblong; calyx with unequal teeth, the two longer tridentate; calyx-teeth in fruit contracted over the 2-celled capsule; seeds 9 to 11, small; embryo short-cylindrical, the cotyledons about equaling the caulicle in length.

Plains of central California southward to Los Angeles.

12. *G. cotulæfolia* Steud. Erect, 7 to 13 in. high, finely pubescent; leaves bipinnatifid, the segments innocuous; bracts and calyx slightly hairy or glabrous at the base; flowers creamy-white, commonly 4-merous; calyx-lobes varying from nearly equal and entire to unequal, with the longer variously toothed; capsule 1-celled, 4-valved, dehiscent from the base, 2-seeded; embryo with entire cotyledons.

Valley fields: Newark, Alameda Co.; North Coast Ranges; Sacramento Valley. Scentless acc. to Greene. *Navarretia nigellæformis* Greene, with multifid bracts, is said by Mrs. K. Brandegee to be a yellow-flowered form of this species; it is found at Antioch.

13. *G. pubescens* H. & A. Erect, usually branching above, 8 to 18 in. high, puberulent; leaves pinnately divided with the divisions laciniately lobed; terminal portion of the leaf less deeply divided or merely laciniate-toothed, so that the rachis appears as if spatulate-dilated; 3 calyx-teeth small and entire, 2 longer and toothed; corolla deep blue, 7 or 8 lines long, the throat funnelform; stamens exserted; capsule 1-celled, 4-valved as in *G. cotulæfolia*; cotyledons of the embryo parted into 3 lobes, the divisions so deep as to give the appearance of 6 cotyledons.

Coast Ranges (Calistoga, Vacaville, etc.); very common in the Sierra Foothills. Herbage with a strong hircine odor acc. to Greene.

14. *G. squarrosa* H. & A. SKUNKWEED. Erect and simple or with many branches from the base, 8 to 14 in. high, pubescent and noxiously glandular; leaves once or twice pinnatifid, the segments lanceolate and often crowded; calyx 6 lines long, very scarious below, the teeth lanceolate and pungent; corolla blue, its tube little or scarcely at all exceeding the teeth; stamens included; seeds many, small; embryo thick.

Common in the Bay Region (Monterey Co., San Francisco, Oakland, Berkeley, Napa Valley, etc.), ranging northward to Oregon. Not seen by us in the inner Coast Ranges or Sierra Nevada.

15. *G. mellita* Greene. Diffusely branching from the base, 3 to 6 in. high, the stems very slender, brownish, glandular-puberulent with somewhat whitish hairs; leaves pinnately parted into linear-subulate entire or toothed segments; bracts dilated and laciniately toothed or cleft into narrow divisions, or the middle division ovate, abruptly cuspidate and often entire; heads small, $\frac{1}{2}$ in. broad or less; calyx unequally 5-toothed; corolla minute, not exceeding the calyx, very pale blue; stamens not exserted.

Seemingly very local plant in the region immediately north and south of the Bay; Belmont; Calistoga; Vacaville. Honey-scented acc. to Greene.

NAVARRETIA PARVULA Greene from Crystal Springs, San Mateo Co., has a corolla about 4 lines long with the 2 posterior stamens included and the 3 anterior exserted.

16. *G. heterodoxa* Greene. Stems very slender, erect, branching, slightly pubescent, 5 to 11 in. high; internodes long; lower leaves with narrowly linear rachis and many pinnate short-subulate segments; uppermost leaves lanceolate and entire except at the laciniately cleft base; bracts lanceolate to broadly ovate, laciniate-toothed towards the base; calyx-segments entire, nearly equal; corolla blue, with exserted declined stamens; capsule 8 to 14-seeded, the seeds small.

Coast Range hills; Napa and Sonoma Cos. to Santa Clara Co. June. Subspecies of the next. Mephitic-scented acc. to Greene. The valves of the capsule show a tendency to dehisce from the base.

17. *G. atractyloides* H. & A. Stems stoutish, low and spreading or procumbent, somewhat purplish and villous-pubescent, 2 or 3

to 6 in. long; leaves and bracts rigidly coriaceous, oblong-lanceolate to ovate, 2 to 4 lines broad, the margin armed with subulate or aristate teeth; segments of the calyx moderately or very unequal, ovate to lanceolate, entire, setaceous at apex; corolla narrowly funnelform, purple, 7 to 9 lines long; seeds about 10 in each cell.

Dry hills of the Coast Ranges: Clear Lake southward to Southern California. July. Habit suggesting certain species of *Chorizanthe*.

18. *G. viscidula* H. & A. Erect, 2 or 3 in. high, viscid-pubescent; leaves $1\frac{1}{2}$ in. long or less, narrow, with broad rachis and remote short-subulate lobes; bracts little dilated; corolla rather large, blue-purple, the tube exserted, the limb 2 lines broad, its lobes elliptic; ovules 1 to 4 in each cell.

Plains and bases of low hills, in sandy soil: San Rafael; Walnut Creek; Sonoma; Napa Valley; Sacramento Valley; Sierra Foothills. June. While commonly very dwarfish, it sometimes becomes larger and makes a spreading or subprostrate plant 1 ft. broad.

4. LINANTHUS Benth.

Ours low or slender annuals. Leaves opposite, palmately divided to the base into narrowly linear or filiform divisions (almost seeming as if in whorls in some species), rarely entire, rarely with some uppermost alternate. Flowers scattered or in terminal capitate clusters. Calyx-tube scarious between the ribs or angles, its teeth equal. Corolla subrotate, funnelform, or short-salverform. Stamens equally inserted on the corolla. Capsule with few to many seeds in each cell. (Greek linon, flax, and anthos, flower.)

Corolla nearly rotate, funnelform, or salverform; flowers solitary, on filiform pedicels (except in the first); stems dichotomously branching.

Corolla short salverform, white or nearly so, its lobes conspicuously convolute in the bud; stamens inserted below the middle, included; flowers terminal or in the forks, on short stout pedicels or subsessile; calyx cylindrical, white-scarious between the ribs.—Subgenus *EULINANTHUS*.

Corolla 1 in. broad. 1. *L. dichotomus*.

Corolla various; stamens inserted at the throat; flowers on slender or capillary pedicels.—Subgenus *DACTYLOPHYLLUM*.

Calyx disposed to be turbinate; flowers white, $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, in a loose panicle; corolla nearly rotate, its tube scarcely any. 2. *L. liniflorus*.

Calyx cylindrical; corolla with distinct tube.

Corolla white, narrowly funnelform, 2 lines broad. 3. *L. pusillus*.

Corolla purplish or bluish, 3 to 5 lines broad.

Corolla funnelform; herbage not glandular. 4. *L. ambiguus*.

Corolla nearly salverform; glandular-hirsutulous at the nodes. 5. *L. Rattani*.

Corolla salverform; flowers crowded into leafy-bracted capitate clusters at the ends of the stems or branches; calyx-teeth equal; corolla salverform.—Subgenus *LEPTOSIPHON*.

Corolla-tube little, if at all, exceeding the lobes. 6. *L. densiflorus*.

Corolla salverform, its tube filiform and elongated, several times the length of the limb.

Corolla much exceeding the bracts.

Corolla twice or scarcely twice the length of the bracts, its lobes 3 to 4 lines long; relatively stout plants. 7. *L. androsaceus*.

Corolla usually more than twice the length of the bracts.

Lobes of the corolla 2 to 3 lines long; flowers purple, pink or pale yellow. 8. *L. parviflorus*.

Lobes of the corolla 1 line long; flowers golden yellow. 9. *L. acicularis*.

Lobes of the corolla 1 to 1½ lines long; flowers purplish or pinkish. 10. *L. bicolor*.

Corolla commonly not exceeding the bracts; bractlets conspicuously hirsute-ciliate; rigid plant. 11. *L. ciliatus*.

1. *L. dichotomus* Benth. EVENING SNOW. Erect, simple or branching from near the base, 5 to 9 in. high; nodes few and internodes very long, twice to many times as long as the leaves; flowers terminal or sessile in the forks; ribs of the calyx prolonged into linear-acerose teeth; corolla salverform, white or nearly so, its tube equaling the calyx-tube, its lobes strongly convolute in the bud, broadly obovate, erose, the limb 1 in. broad; filaments at the very base enlarged, somewhat winged and more or less hairy; cells of capsule many-seeded; seeds not mucilaginous when wet.—(*Gilia dichotoma* Benth.)

Common on open slopes, mostly on high hills: Coast Ranges; Sierra Foothills; San Joaquin plains; Southern California. Mar.—May.

2. *L. liniflorus* (Benth.) Greene. One ft. high or somewhat more, mostly branching above; leaf-segments ½ to 1 in. long; flowers white, on slender pedicels ½ to 1½ in. long, in a diffuse panicle; corolla with nearly obsolete tube; limb rotate, ½ to ¾ in. broad, the obovate lobes naked, with several blue longitudinal lines or veinlets; stamens ½ as long as corolla-lobes; filaments with a densely pilose ring just above the base, the corolla pubescent at their insertion; ovules 6 to 8 in each cell.—(*Gilia liniflora* Benth.)

Plains and foothills: Solano Co.; Stockton; San Mateo Co.; Loma Prieta and southward to Southern California. May—June.

3. *L. pusillus* (Benth.) Greene. Very slender, 3 to 6 in. high; calyx cylindraceous, 1 to 1½ lines long, its teeth as long as the tube; corolla narrowly funnelform or subsalverform, its tube dilated somewhat above the middle, not exerted from the calyx or very slightly, the lobes seldom exceeding the calyx-lobes, the limb 2 lines broad.—(*Gilia pusilla* Benth.)

Dry hillsides in Chamisal, Napa Valley, June 2, 1896. The corolla after flowering is promptly pushed up by the rapidly growing capsule and the tube contracts in withering, so that the corolla in age frequently has the appearance of being salverform and somewhat exerted. Distinct from *L. filipes* Greene, common in the Sierra Foothills, which has a turbinate calyx and a short-funnelform corolla with broad limb. *L. BOLANDERI* Greene is, perhaps, but a variety. It was first collected at Ukiah by Bolander. Gray's herbarium seems to indicate that his attributing the plant to Sonoma Co. was an inadvertence; however, it is not unlikely that it may be found south of Mendocino Co.

4. *L. ambiguus* (Rattan) Greene. Mostly 3 or 4 in. high; pedicels about 6 lines long; corolla 4 to 6 lines long, nearly 3 times the length of the calyx, not strictly salverform, its tube somewhat or not at all exerted, its brown-purple obconic throat scarcely exceeded by the

spreading lobes; limb bluish purple, 4 lines broad; ovules 2 in each cell.—(*Gilia ambigua* Rattan.)

Low hills: Santa Clara Valley and near Livermore. May. Some of the flowers show a glandular black band $\frac{1}{2}$ line in breadth midway of the calyx-tube.

5. **L. Rattani** (Gray) Greene. Ten to 12 in. high, glandular-hirsutulous at the nodes and even the flowers with gland-tipped hairs; pedicels $1\frac{3}{8}$ in. long or less; calyx cylindraceous, in anthesis 1 line long, accrescent in fruit to 2 lines long; corolla nearly salverform, with a long slender tube and short funnelform throat, the tube 3 to 5 lines long, exerted barely 1 line to exceeding 3 lines, the throat yellow, the limb blue and 3 to 5 lines broad; seeds small, very rugulose, one to each cell or the third cell empty.—(*G. Rattani* Gray.)

Santa Cruz Mountains, 1896; first collected by Volney Rattan north of Clear Lake, 1884. June. Remarkable for the variable exertion of the corolla-tube, even on the same plant.

6. **L. densiflorus** Benth. Erect, simple, 5 in. to 2 ft. high; divisions of the palmately divided leaves 5 to 11, linear-filiform and rigid, ciliate towards the base and somewhat scabrous on the margins; corolla lilac or white, 1 in. long or less, its tube only equaling or little exceeding the obovate lobes, little if at all exerted beyond the calyx-teeth, its limb $\frac{1}{2}$ in. broad, more or less; seeds 3 in each cell, strongly wrinkled.—(*Linanthus grandiflorus* Greene.)

Coast Range valleys or higher hills, infrequent: Point Reyes; Alameda; Santa Cruz Mountains; Monterey Co. and southward. June.

7. **L. androsaceus** (Benth.) Steud. Stoutish, usually simple, 7 to 11 or 15 in. high, finely tomentose or glabrate; lowest leaves spatulate; bracts ciliate, otherwise nearly glabrous; flowers usually many; corolla lilac, lavender, pink or white, 1 in. long, much exceeding the bracts, the lobes 3 to 4 lines long; the throat dark purple with yellow border, 1 line long; stamens little surpassing the throat of the corolla.

Common everywhere in the Coast Ranges and Sierra Nevada on low hills and at middle altitudes. Apr.

8. **L. parviflorus** (Benth.) Greene. Simple or with few branches from the base, erect, commonly 3 to 6 or 11 in. high, almost glabrous; bracts scabrous or hirsutulous, not ciliate or scarcely so, commonly 3 or 4 lines long; segments of the leaves obovate- or linear-spatulate; corolla purple, pinkish or pale yellow, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, the lobes oval, 2 to 3 lines long or less, tinged with red or brown on the outside, the throat yellow; stamens half or commonly more than half as long as the corolla-limb.—(*Gilia micrantha* Benth.)

The most common species, abundant in open ground in the hill country. It is one of the annuals which figure in the vernal landscape color effects in the Coast Ranges, often occupying extensive slopes of the lower or higher hills to the exclusion either partially or wholly of other species.

Var. **rosaceus** (*Linanthus rosaceus* Greene). Much branched from the base; corolla rose-color or white, larger than in the type.—San Francisco sand hills.

9. *L. acicularis* Greene. But 1 to 4 in. high, very slender, somewhat rigid, less pubescent than *L. parviflorus*; leaf-segments linear-acerose; corolla golden-yellow throughout, its tube slenderly filiform, about 6 lines long, the obovate lobes not exceeding 1 line.

Not common: Oakland Hills; Marin Co.; Napa Valley; Hoopa Valley. Apr.-May.

10. *L. bicolor* (Nutt.) Greene. Very near *L. parviflorus* but dwarf, 1 to 3 in. high; leaves and bracts hispidulous-ciliate; limb of corolla very short (1 to 1½ lines long) in proportion to the tube which is 6 to 9 lines long, dull purple or pink with yellow throat.—(*Gilia tenella* Benth.)

Rarely collected, but doubtless overlooked for *L. parviflorus*: Hoopa Valley; near Suisun; Marin Co.; Mt. Diablo Range; Loma Prieta and southward to Southern California.

11. *L. ciliatus* (Benth.) Greene. Rigid, 4 or 5 in. (rarely 1 ft.) high; stems finely tomentose, the internodes long; leaves scabrous and hirsute; flowers comparatively few; corolla 6 to 9 lines long, not exceeding or often much exceeding the conspicuously hirsute-ciliate bracts, deep rose-red, often fading white, the lobes 1 line long, seldom more; calyx-lobes acerose.—(*Gilia ciliata* Benth.)

Hills and mountain slopes, among Oaks and other trees: Coast Ranges (Napa Co., Mt. Diablo); Sierra Nevada; Southern California.

91. HYDROPHYLLACEÆ. PHACELIA FAMILY.

Herbs or shrubs with opposite or alternate leaves. Flowers regular, 5-merous (except the superior ovary which is 1 or 2-celled), in racemes or spikes (often scorpioid), or capitate, or solitary. Stamens near the base of the corolla, alternate with its lobes. Styles 2, distinct, or more or less completely united even to the stigmas. Fruit a 1-celled capsule or partly or quite 2-celled by the intrusion of the placenta or their union in the axis; valves 2, rarely 4. Seed-coat pitted, the cavities regular and honeycomb-like.

Leaves (at least the lower) opposite, or alternate or radical in no. 1; ovary and capsule 1-celled; placenta expanded and forming a sac-like lining to the pericarp; style 2-cleft; ovary more or less hispid.

Stamens longer than corolla; flowers in head-like clusters; perennials. . .

1. HYDROPHYLLUM.

Stamens shorter than corolla; flowers solitary or in racemes; annuals.

Calyx with a reflexed appendage at each sinus; seeds carunculate. . . .

2. NEMOPHILA.

Calyx naked at the sinuses; seeds not carunculate. . . .

3. ELLISIA.

Leaves alternate or mainly radical in no. 6; calyx appendages none.

Ovary and capsule 1-celled, or incompletely or completely 2-celled by the approximation or union of the linear or lanceolate placenta (borne on semisepta) in the axis; annual or perennial herbs.

Style 2-cleft, at least at apex; ovary more or less pubescent; flowers in scorpioid racemes or spikes.

Corolla blue, purple, or white, deciduous.

4. PHACELIA.

Corolla yellow or cream-color, persistent.

5. EMMENANTHE.

Style and stigma entire; ovary glabrous; corolla white; flowers racemose.

6. ROMANZOFFIA.

Capsule almost 2-celled, 4-valved, the valves bearing the dissepiments or half-partitions on their middle; styles 2, distinct; shrubs with thick leaves.

7. ERIODICTYON.

1. **HYDROPHYLLUM** L. WATER-LEAF.

Perennial herbs with horizontal rootstocks. Leaves alternate or mainly radical, pinnate or pinnately parted, long-petioled. Flowers in capitate cymes. Calyx without appendages. Corolla campanulate, 5-lobed, the tube with a nectar-bearing grooved appendage opposite each lobe. Stamens exserted, the filaments hairy at the middle. Style filiform, exserted. Ovary hispid. Capsule 2-valved, 1 to 4-seeded. (Greek hudor, water, and phullon, leaf.)

1. **H. occidentale** Gray. Twelve to 17 in. high; leaves 7 to 12 in. long; leaflets 9 to 15, incised, the terminal ones not distinct; peduncles generally exceeding the leaves, bearing 1 or 2 capitate clusters of bluish flowers.

Summit of Mt. Diablo, *Brewer*, no. 1176; Sherwood Valley, Mendocino Co., *Davy*, no. 5195; Sierra Nevada.

H. CAPITATUM Dougl. var. **ALPINUM**. Wats. Almost stemless plant; rootstock with clusters of fleshy-fibrous roots; leaves roundish or ovate in outline, pinnately lobed or divided, 2 to 3 in. long, much shorter than the petiole; flowers in a loose cyme on a short peduncle, surpassed by the leaves.—Sierra Nevada.

2. **NEMOPHILA** Nutt.

Delicate low annuals. Leaves opposite, or the uppermost alternate, more or less pinnate. Flowers mostly showy, solitary or inclined to be racemose. Calyx with a reflexed appendage in each sinus, accrescent. Corolla rotate to broadly campanulate, in all our species longer than the calyx, with 10 internal appendages at base. Stamens shorter than the corolla, inserted near its base. Anthers usually sagittate-oblong. Styles more or less 2-cleft. Ovules 4 to 20. Seeds carunculate, the caruncle later deciduous. (Greek nemos, a grove, and phileo, to love.)

Flowers small; corolla white or whitish, 2 to 5 lines broad; leaves opposite or the upper often alternate, mostly longer than the peduncles, slender-petioled 1. *N. parviflora*.

Flowers large.

Leaves all opposite, not auricled, shorter than the peduncles.

Corolla bright blue (or pale blue or white in the vars.) . 2. *N. insignis*.

Corolla with velvet-purple center, the upper portion white with purple veins 3. *N. venosa*.

Leaves mostly alternate, auricled at base, shorter than or equaling the peduncles 4. *N. aurita*.

1. **N. parviflora** Dougl. Stems slender and weak, trailing or procumbent; leaves pinnately lobed, parted, or divided into 3 to 5 lobes, but exceedingly diverse as to outline and segmentation; calyx-appendages rather conspicuous, or sometimes almost none; corolla white or whitish, 2 to 5 lines in diameter, narrowly campanulate to almost rotate, the lobes longer than the tube; scales adherent by one edge; filaments filiform, inserted on the very base of the corolla; seeds 1 to 4, often deeply pitted.

Common throughout California in shady places in the Coast Ranges and Sierra Nevada. Mar.—Apr. The studies of Mr. H. P. Chandler on this species show that the corolla-scales are remarkably inconstant in

shape and size, not only on plants which are very much unlike in habit, etc., but that a wide range of variation is also found in series of specimens which agree in habit, leaves, and shape of corolla.

2. *N. insignis* Dougl. BABY BLUE EYES. Diffusely spreading, the stems 2 or 3 in. to 1 ft. long; herbage pubescent with subappressed hairs; leaves mostly $\frac{3}{4}$ to $1\frac{1}{2}$ or 2 in. long, pinnately lobed, the lobes elliptic-ovate with narrow deeply incurved sinuses; peduncles 1 to $2\frac{1}{2}$ (rarely 5) in. long; calyx-lobes ovate-lanceolate; corolla bright blue or the center white or the whole corolla pale, often dotted towards the center; scales 2 to each stamen, each pair consisting of vertical lamellæ beginning at the base of the filament, thence slightly divergent, slightly free at apex, very hairy; anthers short-sagittate; styles cleft $\frac{1}{3}$ the way down; ovary very hirsute.

Low and moist places on the plains of the Sacramento and San Joaquin, westward through the Coast Range valleys to sandy fields in the vicinity of the sea. Mar.-Apr.

Var. *intermedia* (*N. intermedia* Bioletti). Corolla $\frac{3}{4}$ to 1 in. wide, bright blue to white, distinctly blue-veined, more or less punctate with dull purple dots; scales extending nearly to the sinuses.—North Coast Ranges; Contra Costa and Alameda Cos.

Var. *atomaria* (*N. atomaria* F. & M.). Corolla white, closely dark-spotted nearly to the edge; scales narrow and long-hairy.—Springy places among the hills.

3. *N. venosa*. Stems 4 or 5 in. long, diffusely branching; herbage sparsely hairy; leaves pinnately parted into ovate divisions which are entire or cleft and mucronate at apex; corolla 8 to 10 lines broad, its lower half of velvet-purple color, the upper portion white with many nearly parallel longitudinal purple veins which are more or less branched and confluent within the margin; scales of the corolla conspicuously long-hairy.

Known only from specimens collected by Mrs. Peckinpah in the mountains west of Yountville, 1898. It is to be noted that there are garden forms which are very suggestive of this species.

N. MACULATA Benth. is a strikingly handsome species of the foothills and middle altitudes of the Sierra Nevada, the white petals with a large deep violet blotch at the summit.

4. *N. aurita* Lindl. PURPLE NEMOPHILA. Stems 4-angled, $1\frac{1}{2}$ to 4 ft. long, succulent, weak, pubescent, the angles armed with scattered short reflexed bristles and the whole herbage pubescent and rough-hispidulous; leaves 2 to 3 in. long, deeply pinnatifid into several oblong or lanceolate, mostly retrorse lobes, with broad auricled bases; flowers in the axils of leaves or above in a leafless raceme; calyx-appendages rather small; corolla dark violet, 8 to 11 lines broad; scales partly free, in pairs at the base of each stamen and partly encircling the filament, truncate at summit and finely denticulate; ovules 4; seeds globose, reticulate, the spaces pit-like.

In shady places, disposed to climb by aid of its somewhat hooked prickles and forming tangles among low shrubs or brushwood. Common southward: Santa Monica Cañon, Barber, 1898; near

Gaviote Pass, Santa Barbara Co., *Brewer*, 1861; Monterey, *McLean*, 1875. Infrequent northward: Oakland Hills. Also in the Sierra Nevada. Not recorded from the region north of San Francisco Bay.

3. ELLISIA L.

Similar to *Nemophila*, but the leaves pinnately parted or bi- or tri-pinnately dissected and the bractless flowers in axillary peduncled racemes. Calyx without appendages at the sinuses, and usually much enlarged under the fruit. Corolla white, campanulate, shorter or little longer than the calyx, the internal appendages minute or none. Anthers oval or oblong. Ovules 4 to 8. Seeds not carunculate. (John Ellis, English botanist of the 18th century, whom Linnaeus called a "bright star of natural history.")

Leaves once pinnately parted; ovules 4, borne on the front of the placenta.

Leaves twice to thrice pinnatifid; ovules 8, 2 on the front and 2 on the back of each placenta 1. *E. membranacea*.
 2. *E. chrysanthemifolia*.

1. *E. membranacea* Benth. Stems procumbent, 1 to 2 ft. long; herbage glaucous, the leaves with a few short scattered stiff hairs, the stems with minute prickles on the angles; leaves pinnately divided into 3 to 5 (or sometimes as many as 9) entire mostly broad divisions, which are obtuse at apex and broadest at base; petiole wing-margined; flowers racemose, few or many on the peduncles; calyx without appendages, its lobes ciliate-bristly; corolla white with a small lance-shaped purple spot in the center of each lobe, 2 lines broad, no scales in the throat but with 10 glandular elevations; capsule with several muciculate prickles, 1 or 2-seeded; seed globose, reticulated.

Shady places in the foothills: Antioch and Evergreen, Santa Clara Co., southward to Southern California. Mar.—Apr. In vegetative habit strikingly similar to *Nemophila aurita*.

2. *E. chrysanthemifolia* Benth. Stem erect, freely branching, 1 to 2 ft. high; leaves tri-pinnatifid; flowers loosely racemose; corolla open-campanulate, surpassing the oval calyx-lobes; the placenta line and exactly conform to the valves; two roughened seeds are borne on the front of each placenta, and smooth ones are concealed behind each placenta, that is, between the placenta and the valve.

Shady ground: San Francisco Bay southward to Southern California. Mar.—Apr.

4. PHACELIA Juss.

Perennial or annual herbs of marked aspect, with alternate leaves. Flowers blue or white, in scorpioid spikes or racemes. Calyx chorisepalous or nearly so, commonly accrescent. Corolla from nearly rotate to campanulate, tubular or funnelform, promptly deciduous, the tube commonly with internal lamellate projections or appendages. Stamens inserted on the base of the corolla. Style 2-cleft. Capsule 1-celled, 2-valved, the thin septa-like placenta adherent. Seeds reticulate-pitted or favose. (Greek phakelos, a cluster, many species with crowded flowers.)

P. NAMATOIDES Gray has mainly opposite leaves.—Sierra Nevada.

Ovules 4 or more on each placenta; capsule not less than 6-seeded; stamens shorter than (rarely equaling) the corolla; annuals.

Corolla-tube with internal scales or appendages.

Leaves pinnatifid; corolla open-campanulate, twice the length of the calyx 1. *P. Douglasii*.

Leaves entire or mostly so.

Corolla narrow, 3 lines long or less, little larger than the calyx 2. *P. circinatifomis*.

Corolla rotate-campanulate, 6 to 9 lines broad, much longer than the calyx 3. *P. divaricata*.

Corolla-tube without appendages; leaves coarsely toothed; corolla narrowly funnelform, limb 3 lines broad 4. *P. suaveolens*.

Ovules 2 to each placenta; capsule 1 to 4-seeded; stamens exserted or included; corolla-tube with appendages.

Leaves pinnately parted or divided, the divisions pinnately toothed or incised.

Fruiting sepals chartaceous, oblong to broadly ovate; stamens not exserted; annual 5. *P. ciliata*.

Fruiting sepals herbaceous.

Leaf-divisions rather coarse; fruiting sepals linear-spatulate to obovate; stamens exserted; perennial (?) 6. *P. ramosissima*.

Leaf-divisions fine; annuals.

Fruiting sepals linear-spatulate to obovate; appendages with free pointed apex; stamens little or not at all exserted 7. *P. distans*.

Fruiting sepals linear; appendages entirely adnate; stamens conspicuously exserted 8. *P. tanacetifolia*.

Leaves with shallow lobes, not parted or divided; annuals.

Stamens exserted 9. *P. malvæfolia*.

Stamens included 10. *P. Rattani*.

Leaves entire or pinnately parted or divided into 3 to 7 entire lobes, the terminal frequently largest.

Stamens conspicuously exserted, bearded at the middle; perennials or biennials.

Herbage pubescent and hirsute 11. *P. Californica*.

Herbage hispid-bristly with stinging hairs 12. *P. nemoralis*.

Stamens glabrous, included; annual 13. *P. Breweri*.

1. *P. Douglasii* (Benth.) Torr. Branched from the base with ascending or decumbent stems 4 to 8 in. long, or dwarf and but $1\frac{1}{2}$ in. high; herbage puberulent and hirsute with mostly spreading hairs; leaves elongated-oblong or linear in outline, pinnatifid or pinnately parted into several or many lobes, the terminal not larger; flowers loosely racemose; pedicels slender, frequently longer than the flowers; sepals spatulate, 1 to 3 lines long, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the open-campanulate light blue corolla; internal appendages semi-oblongate; style 2-cleft above the middle; ovules to each dilated placenta 12 to 14; capsule ovate, mucronate; seeds scrobiculate.

Sandy soils near the ocean: Lake Merced to Monterey and southward. Antioch (ovary especially hairy on each side near base of style; ovules as many as 24 to each placenta; stamens dilated toward the base and sparsely hairy). Mar.-Apr. In habit suggestive of *Nemophila insignis*.

2. *P. circinatifomis* Gray. Diffusely branching from the base, 5 in. high, puberulent and hispid; leaves elliptic to oblong-lanceolate, parallel-veined, entire, strigose-hispid; flowers short-pedicel or at first nearly sessile in dense racemes or spikes; sepals in fruit linear-

spatulate, nearly or quite 6 lines long, twice or thrice the length of the capsule. hirsute or hispid with long spreading hairs, especially toward the base; corolla dull white (?), narrowly funnelform, $2\frac{1}{2}$ to 3 lines long; capsule ovate, acute or mucronate, 6 to 16-seeded; seeds scrobiculate.

Mt. Hamilton; near the summit of Mt. Diablo; Mariposa Co., acc. to Brandegee; the only reported stations.

3. *P. divaricata* (Benth.) Gray. Diffusely branched from the base, the branches 3 to 10 in. long or more; herbage both pubescent and hirsute; leaves from ovate to broadly oblong, 1 to 2 in. long, equaling or exceeding the petioles, entire or rarely with a pair of supplementary lobes at summit of the petiole; pedicels about a line long; sepals in fruit linear, 4 to $6\frac{1}{2}$ lines long, sparsely hispid-ciliate, with somewhat thickened margins and prominent midnerve and cross-veins; corolla blue, broadly open-campanulate, 6 to 9 lines broad; style 2-cleft at apex; seeds 7 to 10, somewhat pitted.

Common on open hillsides in the Coast Ranges of middle California: Mt. Diablo, *Brewer*, *McLean*; Oakland Hills, *Setchell*, *Dary*; Crystal Springs, *Bolander*; Sausalito, *Kellogg* and *Harford*; Mt. Tamalpais. Mar.-Apr.

4. *P. suaveolens* Greene. Branched at the base, the branches erect or ascending, 12 to 15 in. high; herbage pubescent and glandular, very sweet-scented; leaves elliptic to oblong, coarsely and sometimes doubly toothed, 1 to 2 in. long, on petioles nearly as long; racemes solitary or in pairs, dense; sepals spatulate, entire, in fruit much exceeding the capsules; corolla pale blue, 3 lines broad, the tube yellowish, 4 lines long, devoid of scales or crests; stamens unequal and unequally coherent with tube; capsule 12 to 16-seeded; seed oval, the coat pitted like a honeycomb.

North Coast Ranges, uncommon: Mt. Tamalpais, *Jepson*, 1891; Petrified Forest, Sonoma Co., *Greene*, 1888; Vaca Mountains, *Platt*, 1898. June. Closely allied to the southern *P. brachyloba* Gray, acc. to Mrs. K. Brandegee.

5. *P. ciliata* Benth. Branched from the base with rather simple ascending branches, 9 to 14 in. high; herbage scabrous, otherwise glabrous; leaves pinnately divided, the divisions oblong, toothed or incised; spikes in terminal clusters or geminate or solitary; sepals in fruit oblong to broadly ovate, chartaceous, 3 to 4 lines long, with thickened margins and prominent midrib and reticulations, sparsely bristly-ciliate; corolla blue; capsule ovate, mucronate; sepals in fruit twice as long, arched over the capsule, their tips meeting; seeds broadly oblong, over 1 line long, the surface with regular or honeycomb-like pits.

Plains and valleys: Willows; Solano Co.; Antioch and southward; abundant on grain farms near Newark, imparting a blue color to the fields, the odor very noticeable, *Miss Crocker*; Belmont. Apr.-May.

6. *P. ramosissima* Dougl. Perennial (?), somewhat diffuse; herbage somewhat glandular; hispid throughout and soft-pubescent

(or only the leaves hispid); leaves pinnately divided into 5 to 9 oblong and serrate or incised divisions, the lower distinct, the upper more or less confluent; stamens and style somewhat exserted; corolla ochroleucous or bluish; calyx-lobes linear-spatulate to obovate, twice the length of the capsule or longer; seeds oblong, 1 line long.

Colusa and Lake Cos. southward to Santa Cruz; Sierra Nevada. June-July.

7. *P. distans* Benth. HILL VERVENIA. Erect and strict, or branching and diffuse, 8 to 13 in. high; herbage with scattered hispid hairs and close fine pubescence; leaves pinnately divided, the divisions commonly linear, once or twice pinnately and (for the most part) finely dissected; spikes scattered, solitary or geminate; sepals unequal, narrowly obovate to spatulate, rarely linear; corolla 3 to 4 lines long, rotate-campanulate, sordid white or violet; internal appendages semi-ovate with free tips; stamens little or not at all surpassing the corolla-lobes; capsule globose.

Higher hills of the Coast Ranges from Napa Valley to Mt. Tamalpais, the ocean at Bodega (where first collected), and southward. Apr.

8. *P. tanacetifolia* Benth. VALLEY VERVENIA. Stoutier than *P. distans*, erect, less frequently branching, the leaves similar but commonly less finely dissected; racemes 3 or 4 in. long, ascending and approximate; sepals linear, beset with rigid bristles, in fruit little exceeding the oval capsule; corolla open-campanulate, 3 to 4 lines long, lavender-color or bluish; internal appendages entirely adnate by the inner margins; stamens much exserted.

Plains and valleys: Marysville Buttes; Sacramento Valley; Vallejo, *Greene*, 1874; Tracy. Apr.

9. *P. malvæfolia* Cham. STINGING PHACELIA. About 1½ ft. high, hispid-bristly throughout, the bristles with a conspicuous pustulate base; leaves simple, petiolate, round- or elliptic-ovate with broad and frequently truncate or cordate base, slightly 5 to 9-lobed, toothed, 1 to 3 in. long; spikes solitary or geminate; corolla longer than the unequal linear-spatulate sepals; stamens exserted; capsule 2-seeded; seeds pitted.

Near the coast: Oakland; Angel Island; San Francisco and southward.

10. *P. Rattani* Gray. Similar but the spikes more slender and elongated; four of the sepals spatulate, one obovate and longer; corolla but 2 lines long.

Russian River, near Ukiah, *Rattan*, June, 1884; northern Sonoma acc. to *Greene*.

11. *P. Californica* Cham. Erect, stout, 1½ to 2 ft. high, from a branched but depressed leafy woody caudex; stems and petioles with scattered hispid hairs; the foliage strigose, either green or canescent; leaves pinnate or pinnatifid, the large terminal lobe elliptic to lanceolate, with 1 to several pairs of smaller or much reduced leaflets or lobes below, or entire; petioles commonly long; spikes dense,

ascending or erect, 1 to 2 in. long, mostly rather short-peduncled, usually in a paniculate cluster at the end of the stem; sepals oblong; corolla purple or white, 3 lines long; filaments exserted, long-hairy at the middle.

Very common throughout our district on rocky points and ledges, in typical form on the San Francisco Peninsula and in Marin Co. May-June. Remarkable in its variability.

Var. imbricata (*P. imbricata* Greene). Taller, often $2\frac{1}{2}$ ft. high; racemes 2 to 4 in. long, scattered in a looser panicle, less commonly in 2's and 3's, and mostly on longer peduncles; corolla dingy white; fruiting calyces ovate, conspicuously imbricated.—St. Helena; foothills of the Vaca Mountains.

12. **P. nemoralis** Greene. Stems 1 or few, simple below, paniculately branched above, $1\frac{1}{4}$ to 3 ft. high, very bristly with stinging hairs; herbage light green; leaves elliptical to oblong, 1 to 4 in. long, simple and entire or with a pair of small leaflets at base; radical and lower leaves on petioles 2 to 3 in. long, uppermost short-petioled or sessile; fully developed spikes 2 in. long or more, slender, in twos or threes, terminating the stems or lateral branches; corolla whitish, 2 lines long, the flower otherwise as in no. 11, to which it is very closely related; capsule 2-seeded.

Shade of open woods: Forest Grove; Oakland; Berkeley; Petaluma. June.

13. **P. Breweri** Gray. Four to 7 in. high, diffusely branching at the base, the stems slender and with rather long internodes; herbage harshly pubescent with rather short hairs; leaves oblong-lanceolate, entire, cleft towards the base, or the lowermost and radical pinnately divided; racemes slender and lax, 2 or 3 in. long, often geminate at the ends of the branches; sepals linear; corolla 2 to $2\frac{1}{2}$ lines long; filaments glabrous, not exserted; capsule ovate, mostly 1-seeded.

Confined to the Mt. Diablo Range: high dry slopes of Mt. Diablo, *Brewer, Parry, Jepson; Mt. Hamilton, Miss Holden.* May-June.

5. EMMENANTHE Benth.

Annuals. Corolla cream-color or yellow, campanulate, persistent; not otherwise differing in technical character from *Phacelia*. (Greek *emmeno*, to abide, and *anthos*, flower, the corolla not deciduous.)

1. **E. penduliflora** Benth. WHISPERING BELLS. Erect, usually much branched from the base, 8 to 14 in. high, villous-pubescent and somewhat viscid; lobes of the pinnatifid leaves numerous, short, toothed or incised; racemes loose, straight, ascending, panicled at summit of the stem; pedicels filiform, as long as the flowers, these soon pendulous; calyx with ample ovate divisions; corolla broadly campanulate, 4 to 5 lines long, the filaments adnate to the very base; style deciduous; placenta conspicuously dilated in the axis; seeds conspicuously pitted in somewhat regular lines.

Higher slopes of the Coast Range Mountains in open places or in the chaparral: Lower Lake Grade to Kelseyville; Vaca Mountains;

Santa Cruz Mountains; Monterey Co., and southward to Southern California. Also in the Sierra Nevada. June-July.

6. ROMANZOFFIA Cham.

Low and delicate perennial herbs with the aspect of some species of *Saxifraga*. Leaves mostly radical (the cauline alternate), round-cordate, crenately-lobed, long-petioled. Flowers white. Inflorescence loosely racemose. Calyx 5-parted. Corolla broadly funnelform, destitute of appendages, deciduous. Stamens unequal, inserted on the base of the corolla-tube. Style filiform, entire; stigma small. Capsule 2-celled or nearly so, with narrow placentæ. Seeds numerous. (Dedicated to Count Romanzoff, promoter of the Russian voyage of Kotzebue, by Chamisso, the German poet, who accompanied the expedition as botanist.)

1. *R. Sitchensis* Bong. Filiform rootstock bearing tubers; stems slender, 4 to 9 in. high; pedicels spreading, much longer than the flowers; calyx-lobes linear or lanceolate, not more than $\frac{1}{3}$ as long as the corolla and exceeded by the capsule.

On moist stones in shady places near the coast: Crystal Springs, San Mateo Co., *Bolander*; Ross Valley trail to the summit of Mt. Tamalpais, *Jepson*; and northward. Rare within our limits.

7. ERIODICTYON Benth.

Low shrubs. Leaves alternate, pinnately veined, finely reticulated, coriaceous, dentate, and petiolate. Inflorescence a terminal, usually naked, panicle of scorpioid cymes. Sepals narrow, not dilated above. Corolla funnelform to campanulate. Filaments more or less adnate to the tube of the corolla, little or not at all exerted, sparsely hirsute. Ovary nearly or quite 2-celled by the meeting of the dilated placentæ in the axis. Capsule 2 lines long or less, first loculicidal, then septicidal, thus 4-valved, each valve with a short beak or acumination and closed on one side by the adherent dissepiment or half-partition. (Greek *erion*, wool, and *diktuon*, a net, by reason of the netted woolly under surface of the leaves.)

1. *E. Californicum* (H. & A.) Greene. YERBA SANTA. MOUNTAIN BALM. Shrub, commonly 3 to 4 ft. high; leaves oblong to oblanceolate, tapering below and frequently above; dentate except at base or below the middle, very glutinous, the areas between the veins and cross-veinlets on the under surface with a close dense felt; calyx 1 line long with linear lobes; corolla white or pale blue, tubular-funnelform, 4 to 6 lines long; stamens and styles included.—(*Eriodictyon glutinosum* Benth.)

Highest mountain slopes and dry ridges, common or even abundant everywhere through the Coast Ranges, and at middle altitudes in the Sierra Nevada, often associated with the Chamisal.

92. BORAGINACEÆ. BORAGE FAMILY.

Herbs, usually rough with coarse hairs. Leaves simple, commonly

entire and alternate. Flowers complete, hypogynous, in one-sided spikes or racemes, coiled spirally when young. Calyx with commonly 5 divisions or teeth. Corolla regular, 5-lobed, with 5 stamens inserted on its tube and alternating with its divisions. Ovary superior, deeply 4-lobed (except in *Heliotropium*), with a simple style inserted between the lobes, in fruit splitting into 4 one-seeded nutlets. Nutlets inserted on a short thick prolongation of the receptacle, here sometimes referred to as the gynobase. Endosperm none, except in *Heliotropium*.

MYOSOTIS SYLVATICA Hoffm., Forget-me-not, is an escape from the gardens in Berkeley and Marin Co. Leaves mostly oblong, the lower petioled, the upper sessile; raceme bractless; pedicels as long as calyx; calyx with hooked hairs; corolla blue, 3 lines broad, with a crown of 5 yellow scales in the throat; stamens inserted on the tube, included; nutlets small, smooth and shining.

LITHOSPERMUM ARVENSE L., Corn Gromwell, a minutely canescent annual with whitish flowers and wrinkled and pitted stony nutlets, has been found at San Francisco, acc. to Greene. It is native of Europe.

Ovary not lobed, in fruit splitting into 4 one-seeded closed cells; anthers connivent; glabrous glaucous succulent perennial . . . 1. *HELIOTROPIUM*.
Ovary deeply 4-lobed, when ripe splitting into 4 one-seeded nutlets.

Nutlets erect; ours annuals.

Corolla white.

Calyx persistent; lowest leaves opposite. 2. *ALLOCARYA*.

Calyx and short pedicel at length deciduous; leaves alternate.

3. *CRYPTANTHE*.

Calyx persistent or circumscissile near the base; leaves mostly in a radical rosette, the cauline alternate. 4. *PLAGIOBOTHRYS*.

Corolla yellow. 5. *AMINCKIA*.

Nutlets flattish, divergent, margined all around or at apex with bristles; corolla minute, white; small annuals 6. *PECTOCARYA*.

Nutlets broad, depressed, covered all over with short barbed prickles; corolla blue with a ring of appendages or crests at the throat; perennials. 7. *CYNOGLOSSUM*.

1. *HELIOTROPIUM* L. *HELIOTROPE*.

Ours a prostrate perennial with white flowers in dense one-sided spikes. Corolla salverform, short, with open throat; sinuses more or less plaited in the bud. Anthers connivent, nearly sessile. Style short. Ovary not lobed but separating when ripe into 4 one-seeded closed cells. (Greek *helios*, sun, and *trope*, a turning. "the flowers beginning to appear at the summer solstice.")

1. *H. Curassavicum* L. Fleshy, glabrous, glaucous, the stems $\frac{1}{2}$ to several ft. long; leaves obovate to broadly oblanceolate; spikes mostly in pairs; corolla white with yellow eye.

Common along the seashore, in stream beds, and in low moist or alkaline lands throughout California. June-Nov.

2. *ALLOCARYA* Greene.

Low herbs, ours annuals, mostly in low wet ground. Leaves linear or narrow, entire, the lowest always opposite. Corollas white,

with yellow throat; pedicels more or less 5-angled under the flowers, persistent. Calyx 5-parted to the base, indurated and somewhat accrescent in fruit. Corolla salverform, with short tube; processes or crests in the throat none (?) or not obvious. Nutlets ovate or lanceolate-ovate, smooth, rugose, tuberculate or even with barbed or prickly points, often carinate on one or both sides. Scar of the nutlet basal or above the base, concave or sometimes raised and stipe-like. (Greek allos, diverse, and karua, nut, the plants separated from *Cryptanthus* on account of the different fruits.)

Herbage densely pubescent, the hairs long and rather soft; var. *vestita* of . .
1. *A. mollis*.

Herbage hispid or rough-pubescent.

Nutlets rugose or tuberculate.

Pedicels about 3 lines long. 2. *A. Chorisiana*.

Pedicels 1 line long to almost none.

Rachis of the spike fistulous-enlarged. 3. *A. salina*.

Rachis of the spike not fistulous.

Pedicels turbinate-thickened beneath the flower; corolla 2 to 3 lines broad; nutlet rather slender, stipitate. 4. *A. stipitata*.

Pedicels not thickened; corolla 1 to 1½ lines broad; nutlet ovate.

Nutlet carinate ventrally and a little past the apex dorsally. 5. *A. Californica*.

Nutlet carinate ventrally and dorsally, the dorsal rugæ dentate-interrupted. 6. *A. trachycarpa*.

Nutlets with barbed or hispid prickles. 7. *A. Greenei*.

1. *A. mollis* (Gray) var. *vestita*. A rather rank plant with many ascending branches 12 to 18 in. long or more; herbage very densely and conspicuously hairy throughout even to the very calyces; spikes 3 to 6 in. long, bractless; flowers about 2 lines broad; fruit not scattered; nutlets either light or dark colored, exceeding ½ line, regularly reticulate on the back, carinate from the apex to below the middle (the carina there vanishing in the meshes of the reticulation) or not carinate, strongly ridged ventrally down to the roundish scar, which is bounded toward the base by a horseshoe-shaped ridge.—(*Allocarya vestita* Greene.)

Petaluma, J. W. Congdon, July 25, 1880; not since collected.

2. *A. Chorisiana* (Cham.) Greene. Diffuse (or at first erect) with reclining branches 7 to 16 in. long, strigose throughout; radical leaves linear-elongated, often 4 in. long; racemes elongated, at length very loose, leafy below; fruiting pedicels about 3 lines long, seldom or never less than 1 line long; calyx little accrescent, about 1 line long, the segments at length spreading; corolla 3 to 4 lines wide; nutlets ovate, ½ line long or a trifle more, dark brown, carinate ventrally only, or also dorsally toward the apex, rugose and minutely granulate; scar linear.

Low ground about San Francisco Bay: Vallejo, Greene; Belmont. Apr.—June.

3. *A. salina*. Branched from the base, strictly erect and simple, 5 to 6 in. high; rachis of the spikes fistulous-enlarged, the flowers rather dense, but strictly unilateral in 2 rather marked rows; calyx-segments spatulate or ovate, very strongly callous-thickened toward the base, the sinus next the axis much deeper than the others, some

of the outer sepals united nearly to the summit in some cases; nutlets roughish papillate, with rather sharp lateral angles, carinate dorsally.

Alvarado, margin of salt marshes, June, 1896.

4. *A. stipitata* Greene. Branched from the base and somewhat spreading, the branches mostly simple, slender, commonly 9 to 12 in. long; leaves linear-oblong, 1 to 3 in. long, or the radical obovate or oblong, attenuate into a long petiole; corolla 2 to 3 lines broad, white with yellow eye or the eye changing to white; sepals at length brownish and often spreading; nutlets somewhat flattened on the back, rugose and papillate, strongly carinate at apex, the dorsal carina continuous to the base or obsolete below the middle; scar short-stipitate; sepals at length brownish and often spreading.

Very common on the plains of the Lower Sacramento and eastern Contra Costa Co. to Hollister. Apr.—May. Very robust specimens frequently show strictly virgate branches nearly or quite 2 ft. long, flower-bearing throughout their entire length. The very short stipe is evident only as a narrow constriction between the elevated scar and the body of the nutlet.

5. *A. Californica* (F. & M.) Greene. Similar in habit to *A. stipitata*; flowers 1 to $1\frac{1}{2}$ lines broad; nutlet ovate, carinate ventrally and a little past the apex dorsally, usually grayish; scar not raised; rugæ mostly oblique and branched.

Coast Range and interior valleys: Russian River; Solano Co. and southward to Hollister.

Var. *stricta* (*A. stricta* Greene). Slender, strictly erect, almost simple, 5 to 7 in. high, somewhat succulent; spikes very dense.—*Calistoga*.

Var. *subglochidiata* Gray. Branches succulent, often prostrate; calyx-lobes accrescent; nutlet with minute muriculations and sharp-edged transverse rugulæ commonly tipped with a tuft of penicillate bristles.—(*A. humistrata* Greene.)

Colusa Co. to the San Joaquin Valley.

6. *A. trachycarpa* (Gray) Greene. More or less diffuse or decumbent; racemes leafy throughout or nearly so; calyx-segments spreading; corolla small, 1 to $1\frac{1}{2}$ lines broad; nutlet broadly ovate, transversely rugose and papillate or muricate, carinate ventrally and dorsally; dorsal rugosities commonly simple, and keel mostly dentate-interrupted.

Sonoma Co., southward to Hollister and the San Joaquin plains. Papillæ of the nutlet sometimes slender and rough, apparently passing into less bristly forms of *A. Greenei*.

A. DIFFUSA Greene.—Nutlets similar, rugose in the same fashion but not so strongly, carinate dorsally but obscurely.

7. *A. Greenei* (Gray) Greene. Diffusely branched from the base, the straggling branches commonly 1 ft. long or more, strigulose-pubescent; leaves linear-oblong; racemes simple, leafy or bracteate below, the flowers scattered; nutlet 1 line long, ovate, rather densely covered with slender barbed prickles; prickles $\frac{1}{4}$ to $\frac{1}{2}$ line long, quite distinct at base.

Abundant in fields of the Upper Sacramento Valley; first collected at Yreka; plains of the Lower Sacramento near Elmira (prickles short and rather sparse as compared with the type); plants from the Lower San Joaquin with the prickles (mostly sparse and much reduced) confluent at base into quite regular walled reticulations are referred here provisionally.

3. **CRYPTANTHE** Lehm. NIEVITAS.

Annuals with the white flowers nearly always sessile and scorpioid-spicate. Calyx 5-parted to the base, as long as the corolla-tube; segments more or less hispid or with hooked bristles, in fruit usually closely embracing the nutlets, eventually deciduous. Nutlets 4, sometimes 3, 2 or 1, smooth, papillate, or muriculate, never rugose; face of nutlet with a ventral groove from the apex to the scar near the base, usually continued beyond the scar as a fork and either open (areolate) or closed. Nutlet attached to the subulate gynobase from the scar half way or wholly to the apex along the groove. (Greek *kruptos*, hidden, and *anthos*, flower, perhaps on account of the minute flowers in some species.)

Nutlets papillate or muricate, 4 (or 3).

Fruiting calyx at least twice as long as the nutlets, these with obtuse lateral angles . . . 1. *C. ambigua*.

Fruiting calyx surpassing a little and somewhat connivent over the acutely angled nutlets.

Plants erect, commonly branching; nutlets about 1 line long . . . 2. *C. muriculata*.

Plants erect, branching but very strict; nutlets smaller . . . 3. *C. Jonesii*.

Plants diffuse, very slender; nutlets $\frac{1}{4}$ line long . . . 4. *C. micromeres*.
Nutlets smooth.

Nutlet 1, much surpassing the short gynobase.

Corolla very small ($\frac{1}{2}$ line broad or less); branches commonly diffuse . . . 5. *C. microstachys*.

Corolla larger (nearly or quite 1 line broad); stem rigidly erect . . . 6. *C. flaccida*.

Nutlets 4 (or 3); gynobase subulate, $\frac{1}{2}$ to as long as the nutlets.

Groove simple, sometimes not closed at base, but not forked . . . 7. *C. leiocarpa*.

Groove forked at base, but no open areola . . . 8. *C. Torreyana*.

1. ***C. ambigua*** (Gray) Greene. Much branched from the base; $\frac{1}{2}$ to $1\frac{3}{4}$ ft. high, rough-hirsute throughout; leaves linear, 1 to $1\frac{1}{2}$ in. long; spikes 1 to $2\frac{3}{4}$ in. long, commonly very loose below, ternate or geminate, often pedunculate; calyx exceeding 1 line in length; sepals linear, more densely hispid-bristly towards the base; corolla $2\frac{1}{2}$ to 3 lines broad; nutlets gray, 4 or 3, narrowly ovate, papillate but not pointed or prickly, the lateral angle obtuse and the groove more or less closed, with the basal bifurcation open-areolate (or sometimes closed?).

Hills and mountains: St. Helena, June 2, 1896; throughout northern California.

2. ***C. muriculata*** (A. DC.) Greene. Robust, branching, rough-hirsute or hispid, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, with well-developed rather dense spikes mostly in 2's and 3's at the end of the branches; calyx $1\frac{1}{2}$ lines

long; corolla 2 or 3 lines broad; nutlets 1 line long, muricate-papillose, and somewhat rugose on the back; ventral groove and its basal bifurcation mostly closed; lateral angles acutish, distinct.

Mt. Diablo Range, from near Antioch southward. Apr.

3. *C. Jonesii* (Gray) Greene. Erect, strict, 7 to 14 in. high, leafy below; lateral spikes from near the base or above the middle short, often sessile, the terminal spikes longer in a rather close panicle; corolla less than 1 line broad in dried specimens; sepals linear, obscurely unicostate, bristly-hispid, in fruit about 1 line long, slightly surpassing the rough-papillate ovate nutlets which are acutely angled laterally and little more than $\frac{1}{2}$ line long; ventral groove mostly closed and forked below.

Sonoma; Mt. Tamalpais; Santa Cruz, July 1, 1881, and Soledad, May 20, 1882, *M. E. Jones*, who first collected it. Nutlets sometimes smooth and concave on either side of the ventral groove.

4. *C. micromeres* (Gray) Greene. Slender, rather widely branched above the base, 7 to 9 in. high, rough-hirsute almost throughout; spikes mostly terminal or subterminal, not dense, 2 to 4 in. long; nutlets similar to the preceding, little more than $\frac{1}{4}$ line long, slender papillate (or on either side of the ventral groove concave and either papillate or smooth).

Santa Cruz, *Jones*; Sierra Foothills at Mokelumne Hill, *Rattan*, the spikes after the fall of the flowers obscurely flexuous.

5. *C. microstachys* Greene. At first erect and 3 or 4 in. high, later diffuse with ascending or reclining branches $\frac{3}{4}$ to 2 ft. long, bristly throughout; spikes slender, 4 to 6 in. long, rather densely flowered; sepals less than 1 line long, very hispid-bristly; nutlet 1, brown, smooth, ovate, with long and slightly contracted apex, slightly compressed but not angled laterally, $\frac{2}{3}$ to 1 line long; groove closed, with a minute fork at base.

Santa Cruz Mts., June 20, 1896, *Setchell* and *Jepson*; Vaca Mountains, May, 1892.

6. *C. flaccida* (Dougl.) Greene. Strictly and rigidly erect, with few ascending branches at the top, $\frac{3}{4}$ to $1\frac{1}{4}$ ft. high; leaves linear; spikes 2 to 4 in. long, at length not crowded; corolla nearly or quite 1 line broad; fruiting calyx $1\frac{1}{2}$ lines long, appressed to the rachis, its narrowly linear segments thickish at base, connivent above, nearly twice as long as the nutlet, hispid and bearing toward the base a deflexed tuft of bristles; nutlet rostellate-acuminate at apex, the groove enlarged below but not forked.

Common on low dry gravelly hills of the inner Coast Ranges: Sierra Nevada. Apr.-May.

7. *C. leiocarpa* (F. & M.) Greene. Commonly branched from the base, with many erect or ascending branches, 5 to 13 in. long; branches mostly simple below, branching above, and bearing many spikes which are often more or less congested; spikes leafy-bracted, rarely bractless, the terminal longer and interrupted, the lateral short and glomerate; sepals short-linear, hispid-bristly; nutlets usually 4.

rarely 1, narrowly ovate, acute, $\frac{2}{3}$ line long, the ventral groove not forked, or scarcely so.

Sandy lands near the coast, San Francisco, northward and southward. June. Stems sometimes short and caespitose, nearly always from a rather strong taproot. Bristles often pustulate-dilated at base. Nutlets mottled transversely on the ventral side and longitudinally on the back.

8. *C. Torreyana* (Gray) Greene. Erect, branched from the middle and sometimes from the base; spikes commonly elongated, loose below, frequently geminate; nutlet ovate, acute, the groove forked at base, the fork sometimes minute.

Napa Valley, *Torrey* in 1865, specimen seen in the Gray Herbarium; common in the Sierra Nevada, at least northward.

4. *PLAGIOBOTHRYS* F. & M. POP-CORN FLOWER.

Rather slender annuals with mostly soft pubescence, the hairs often rusty when young, especially on the calyx. Leaves mostly in a radical tuft, those of the stem alternate. Racemes spike-like, elongated, loose and sometimes leafy. Pedicels very short or almost none, filiform, persistent. Corolla short, white, with crests or processes at the mouth of the throat (or the crests absent?). Nutlets ovate, carinate on both sides towards the apex and often also laterally margined, on the back rugose or roughened. Insertion above the base or median, the scar raised and rounded and leaving a corresponding depression on the receptacle or gynobase. (Greek plagios, on the side, and bothrus, pit or excavation, the first species having a hollow scar.)

Scar of nutlet raised and rounded with a distinct hole or excavation in the middle of it; erect plants; var. *campestris* of 1. *P. rufescens*.

Scar of nutlet solid.

Nutlets glassy, either papillate-scabrous or almost smooth; very slender erect plants 2. *P. tenellus*.

Nutlets grayish or brownish, rugose or granulate.

Calyx in fruit circumscissile below the middle, the upper portion falling away; erect plants 3. *P. nothofulvus*.

Calyx persistent, not circumscissile; plants with diffuse, straggling or prostrate branches. 4. *P. canescens*.

1. *P. rufescens* F. & M. var. *campestris*. Branching, 1 to 2 ft. high, hispid-hirsute; leaves linear or lanceolate; racemes very loose, leafless and spike-like but the flowers distinctly pediceled; fruiting calyx 2 to 3 lines long, the segments nearly distinct, lanceolate, persistent, more or less reddish even in age; nutlets $1\frac{1}{2}$ lines long, nearly 1 line wide in the middle, abruptly beaked, the transverse rugæ more or less interrupted and often dot-like or granulate; scar raised and ring-like, bordering a deep circular excavation.—(*P. campestris* Greene.)

Low foothills of the Coast Ranges in Solano Co., and northward. Apr.—May.

2. *P. tenellus* Gray. Three to 7 in. high, branching from or near the base, the branches erect or ascending; herbage puberulent

or the leaves hispidulous; leaves of the radical tuft oblong, acute or obtuse, $\frac{1}{2}$ to 1 in. long; cauline leaves few, ovate or ovate-oblong. 2 to 3 or 4 lines long; spikes 1 to 3 in. long, comparatively few-flowered; calyx deeply cleft, at first rusty yellowish, at length pale, sometimes imperfectly circumscissile; nutlets minute ($\frac{1}{4}$ line long), shining and enamel-like on the back, smooth but papillate-scabrous on the lateral angles and often also on the rugæ; rugæ transverse, straight, smooth and low, separated by very fine lines.

Kaweah River, southern Sierra Nevada, *Eastwood*; Napa Mountains, *Jepson*; northern California. Uncommon in our region.

3. *P. nothofulvus* Gray. Plants erect or suberect, 1 to 2½ ft. high; stems 1 to several from the depressed rosulate tuft of leaves, branching mostly above, the branches widely spreading or erect; herbage silky-villous, the hairs very reddish only when young, especially on the calyx and sometimes on the leaves; leaves oblong-ovate or lanceolate, those of the radical tuft oblong-ovate or oblanceolate; spikes leafless; calyx cleft only to the middle, $1\frac{1}{2}$ lines long, in fruit circumscissile below the middle, the upper part falling away and leaving the persistent base about the nutlets; corolla 2 to 3 lines broad.

Hill and mountain sides: St. Helena, Napa Co.; Vaca Mountains: Sierra Foothills. Mar.—May.

4. *P. canescens* Benth. Branches long and straggling, nearly or quite simple, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long, loosely flower-bearing and leafy nearly throughout, or the spike nearly or quite leafless; pubescence pale, soft-villous; leaves oblong to linear or lanceolate; calyx cleft to below the middle, the segments broadly lanceolate, in fruit 2 to 3 lines long; nutlets 1 line long, incurved-connivent, rugose-reticulate, the areola longer transversely, and the lateral angles very distinct.

Livermore Valley; English Hills, Solano Co.; French Camp, Sierra Foothills; Marysville Buttes; first collected by Hartweg in the Upper Sacramento Valley. Apr. Calyx in fruit circular-depressed (the tips of the segments connivent over the nutlets), in age deciduous, the very short stubby pedicel persistent. Plants sometimes erect.

5. *AMSINCKIA* Lehm.

Annuals with rough-hairy herbage, the hairs commonly with pustulate-dilated base, often conspicuously hardened or granular. Flowers yellow, in elongated spikes. Sepals 5, or 4 or 3 through the more or less complete union of two into one. Corolla salverform, the throat somewhat funnelform and with more or less distinct folds, but destitute of crests or processes. Style filiform. Nutlets crustaceous, triquetrous or ovate-triangular, smooth or rough. Cotyledons deeply 2-parted. (Wm. Amsinck of Hamburg, patron of the Botanic Garden in that city.)

Nutlets much flattened on the back, with coarse granulations

1. *A. tessellata*.

Nutlets beset with prickly projections. 2. *A. echinata*.

Nutlets not prickly.

Nutlets carinate on the back, granulate and rugose.

Corolla 6 lines long or more; nutlet somewhat compressed laterally. 3. *A. spectabilis*.

Corolla 5 lines long or less; nutlets much incurved, $1\frac{1}{4}$ lines long 4. *A. intermedia*.

Corolla 6 lines long or less; nutlets $\frac{1}{2}$ line long, scarcely more. 5. *A. lycopsoides*.

Nutlets smooth and polished 6. *A. grandiflora*.

1. *A. tessellata* Gray. Coarsely hispid, 1 to 2 ft. high; leaves linear to oblong-lanceolate; developed spikes 5 to 6 in. long, loose; calyx of 3 or 4 sepals, 1 narrow and 2 broad, or 3 narrow and 1 broad, rusty-hispid, accrescent in fruit with the broadly-ovate foliaceous segments about twice the length of the nutlets; corolla small, orange-yellow; nutlets broadly ovate, abruptly acute, not carinate but flattish on the back, which is surrounded by a dentate border and filled in with a few short transverse rugæ and many wart-like projections fitted closely together, and so resembling a somewhat uneven cobblestone pavement.—(*A. collina* Greene.)

Near Mt. Diablo, *Brewer*; San Joaquin plains.

2. *A. echinata* Gray. Erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, very hispid with white spreading bristles; sepals very narrow, yellow-hispid; corolla light yellow, about twice as long, little dilated at the throat, the limb 2 or 3 lines broad; nutlets muricate with slender points or almost prickly, not rugose.

Plant of the Mohave Region, credited to Antioch.

3. *A. spectabilis* F. & M. Erect, branching above, 1 to $2\frac{1}{2}$ ft. high, with mostly linear or linear-lanceolate leaves; spikes 3 to 7 in. long; calyx-lobes narrowly linear-lanceolate, reddish-hispid, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the corolla-tube; corolla orange-yellow, 6 to 7 lines long with slightly unequal lobes; nutlets somewhat flattened laterally, carinate dorsally and ventrally, reticulate-rugulose and granulate.

Towards the interior.

4. *A. intermedia* F. & M. Erect, frequently widely branched, $1\frac{1}{2}$ to 3 ft. high; stems and branches with scattered white bristles, the foliage densely hispid-bristly with rather shorter bristles; inflorescence hispid and with a short curly pubescence; leaves oblong-lanceolate to linear, thickish, entire; racemes more or less crowded at the top of the stem or branches and leafy-bracteate; developed racemes 5 to 10 in. long, peduncled; calyx-segments rusty-hispid, linear-acuminate, $\frac{1}{2}$ as long as the narrow orange-yellow corollas, in fruit twice as long at least as the nutlets; nutlets incurved, carinate dorsally, scabrous-rugose and granulate, exceeding 1 line in length.

Throughout our district, mostly towards the interior; frequently very abundant on grain fields of the Sacramento Valley, forming rank thickets 3 to 4 ft. high and sometimes called by the country people "Buckthorn."

5. *A. lycopsoides* Lehm. Stems erect, branching, the branches at length decumbent, 1 to 2 ft. long; herbage of a light yellowish green, setose-hispid; leaves ovate-lanceolate or narrowly oblong, with erose-sinuate or entire margins; racemes rather short, frequently

leafy-bracteate; peduncles short or none; calyx sparsely setose-hispid, the lobes lanceolate or ovate-oblong, obtuse, 2 or 3 of the lobes often united; corolla pale yellow, very slender; nutlets brown or blackish, muriculate and rugulose, scarcely more than $\frac{1}{2}$ line long.

Sandy soil along the seaboard: San Francisco. Apr.-May.

6. *A. grandiflora* Kleeb. Robust, hispid, $1\frac{1}{2}$ ft. high; fully developed spikes 5 to 7 in. long; calyx-segments fulvous-hirsute, often partly or wholly confluent so as to appear as 3 or 4, in fruit 5 to 6 lines long; corolla 6 to 7 lines long, deep yellow, with ample limb; anthers nearly sessile, inserted very low in the corolla; nutlets perfectly smooth, polished, light gray, carinate ventrally from the apex to the nearly median oblong scar; lateral angles sharp, back concave.

Antioch, Kellogg. The nearly related *A. vernicosa* H. & A. may be expected within our limits southward; it has smaller flowers and sharply triquetrous nutlets (resembling a grain of buckwheat) with very obscure scar.

6. PECTOCARYA DC.

Low slender obscure annuals with strigose pubescence and narrowly linear leaves. Flowers minute, white, on very short pedicels, scattered along the stems or branches. Calyx deeply 5-cleft, spreading or reflexed in fruit. Corolla with a circle of processes or crests which almost close the throat. Stamens included. Nutlets flat, thin, radiately divergent, bordered at apex or all around with a row of bristles hooked at tip. (Greek pectos, combed, and karua, nut, on account of the row of bristles on the nutlet.)

Nutlet not winged, the acute margin bordered all around by bristles . . .

1. *P. pusilla*.

Nutlet bordered by a wing which bears hooked bristles only at the apex . .

2. *P. penicillata*.

1. *P. pusilla* Gray. Erect, somewhat flexuous, simple or sparingly branched, 3 to 5 in. high, strigulose-canescens; nutlets 4 and equably divergent (or sometimes but 2), 1 line long, cuneate-obovate or somewhat rhomboidal, carinately nerved on the upper face, not winged, the margin bearing a row of slender bristles hooked at the tip.

Shady north slopes in the hills near St. Helena; common about Yreka acc. to Gray. Mar.-Apr.

2. *P. penicillata* (H. & A.) A. DC. Branching at the base, the branches diffuse, 1 to 4 in. long; nutlets divergent in pairs, oblong, 1 line long, surrounded by a wing which is incurved along the middle in age and bears at the rounded apex a series of slender bristles hooked at the tip.

Napa Valley, Jepson, the only known locality in our region.

7. CYNOGLOSSUM L.

Ours a coarse perennial herb with broad petioled leaves. Flowers blue, in a paniced bractless raceme raised on a naked terminal

peduncle. Corolla with a ring of conspicuous appendages or crests at the throat. Nutlets large, depressed, covered all over with short barbed prickles and thus bur-like. (Combined of the Greek *kuno*, dog, and *glossa*, tongue, on account of the shape and texture of the leaves in some species.)

1. **C. grande** Dougl. HOUND'S TONGUE. Erect, 1 to 3 ft. high; leaves mostly radical or subradical, hoary-pubescent beneath, ovate, varying to ovate-oblong or elliptic, rounded at base or truncate, acute or acuminate, 3 to 7 in. long, on petioles often as long; sepals narrowly oblong, obtuse, 2 lines long; corolla 6 to 7 lines long, the tube often purple, the lobes elliptic; stamens inserted at the throat, on very short filaments.

Coast Range woods: Monterey; Oakland Hills; Marin Co.; Vaca Mountains, and northward. Feb.-Mar.

93. VERBENACEÆ. VERBENA FAMILY.

Ours herbs with opposite or whorled leaves. Flowers complete. Corolla bilabiate or almost regular. Calyx persistent. Stamens 4, in 2 pairs. Ovary superior, undivided, 2 to 4-celled, separating at maturity into as many 1-seeded nutlets; style single, entire; stigmas 2 or 1. Endosperm in our genera scanty or none.

Calyx 5-toothed; nutlets 4; diffuse or erect herbs 1. VERBENA.
Calyx 2-cleft; nutlets 2; creeping herbs 2. LIPPIA.

1. VERBENA L. VERVAIN.

Perennial herbs with simple leaves. Flowers in terminal densely-flowered bractless spikes. Calyx narrow, tubular, plicately 5-angled, 5-toothed, mostly enclosing the dry fruit. Corolla salverform with a rather unequally 5-lobed limb. Anthers ovate. Stigmas mostly 2-lobed, the anterior lobe larger, the posterior smooth and sterile. Fruit separating into 4 one-celled one-seeded achene-like nutlets. (Latin name of a certain sacred plant.)

Bracts inconspicuous, not exceeding the flowers.

Stem erect, strict and tall; spikes dense, more or less peduncled; petioles naked 1. *V. hastata*.

Diffusely branching; spikes not dense below, sessile or leafy bracted at base; petioles cuneately margined 2. *V. prostrata*.

Bracts conspicuous, exceeding the flowers; spikes dense, sessile 3. *V. bracteosa*.

1. **V. hastata** L. BLUE VERVAIN. Erect, strict, 2 to 4 ft. high; pubescence short-hispid; leaves oblong-lanceolate, gradually acuminate, rather finely serrate, 4 in. long or less, on petioles $\frac{1}{2}$ in. long; some of the lower leaves commonly hastately lobed at base; spikes numerous; naked at base or more or less peduncled, densely flowered, 2 to 3 in. long, in a close panicle; corolla deep blue.

Banks of the lower Sacramento River: Wilkes Expedition, 1841; Rio Vista, Grand Island and Ryer Island, *Jepson*, 1892.

2. **V. prostrata** R. Br. COMMON VERVAIN. Stems diffusely

branched or spreading; herbage mostly soft-pubescent; leaves oblong-ovate, coarsely serrate, and often laciniately lobed, especially toward the base which is contracted into the cuneately winged petiole; spikes 2 or 3 in. to 1 ft. long, solitary or more commonly loosely paniculate; bracts subulate, shorter than the calyx; corolla violet or blue, 2 lines long; nutlets oblong.

Dry open hill country throughout western California: Humboldt Co.; Sonoma and Vacaville, southward to Alameda Co., Santa Clara Co. and Southern California. July-Sept.

3. **V. bracteosa** Michx. Diffusely much branched, $\frac{1}{2}$ to 1 ft. high or more; leaves pinnately incised or 3-cleft with coarsely serrate lobes, narrowed at base into a winged petiole; spikes commonly dense, sessile; bracts lanceolate, rigid, conspicuously exceeding the flowers, mostly entire or the lowest incised; corolla small, blue.

Lower San Joaquin; probably introduced.

2. **LIPPIA** L. LEMON VERBENA.

Ours prostrate perennial herbs with simple leaves. Flowers small, similar to those of Verbena, disposed in short spikes or heads subtended by broad closely imbricated bracts. Pubescence fine, the hairs fixed by the middle and both ends acute. Peduncles slender, axillary. Calyx small and short, in ours 2-cleft, the lobes entire and lateral. Corolla-limb manifestly bilabiate, 4-lobed, the upper lip retuse or emarginate. Style mostly short; stigma thickish, oblique. Pericarp more or less corky, not readily separating into the 2 nutlets. (In memory of Dr. A. Lippi, a French naturalist, killed in Abyssinia, in 1703.)

Leaves thickish, oblanceolate or obovate 1. *L. nodiflora*.
Leaves thinnish, ovate 2. *L. lanceolata*.

1. **L. nodiflora** Michx. Stems extensively creeping from a lignescent perennial base; herbage minutely canescent throughout; leaves thickish, cuneate-oblanceolate or -obovate, sessile, $\frac{3}{4}$ to nearly 1 in. long, sharply serrate towards the apex; peduncles filiform, 1 to 4 in. long, much exceeding the leaves; heads cylindraceous in age, 3 lines thick; calyx with 2 low triangular teeth, these laterally disposed and entire or notched; corolla white, $1\frac{1}{2}$ lines broad, the lower lobe transversely oblong; fruit globose or didymous.

Lower Sacramento and San Joaquin, especially on river banks. Esteemed as a plant covering for the soil on levees for the purpose of resisting erosion. July-Sept.

2. **L. lanceolata** Michx. Similar to the preceding but greener; leaves thinner, 1 to $2\frac{1}{2}$ in. long, ovate, sharply serrate except at the broadly cuneate base which is abruptly narrowed to a short petiole, pinnately straight-veined; peduncles often shorter than the leaves; corolla bluish white.

Common on muddy banks of the islands lying near the confluence of the Sacramento and San Joaquin Rivers: Grand Island; Bouldin Island, etc.

94. LABIATÆ. MINT FAMILY.

Aromatic herbs or low shrubs with square stems and always opposite simple leaves. Flowers solitary in the axils or more commonly in small cymes; cymes sessile in the axils of the opposite leaves (rarely peduncled), commonly dense and having the appearance of a whorl, and thus denominated in the descriptions. Subtending leaves of the whorls frequently bract-like and the internodes short, the inflorescence thus becoming spike-like, or the whorl sometimes terminal and head-like. Calyx always synsepalous, frequently bilabiate, usually 5-toothed. Corolla with a distinct tube, bilabiate, commonly with 2 lobes in the upper lip and 3 lobes in the lower lip. Stamens 4, in 2 pairs, or the superior (upper) pair of stamens wanting or represented by sterile filaments. Ovary superior, 4-lobed (or 4-parted in *Trichostema*), separating when ripe into 4 small 1-seeded nutlets. Style single, situated in the depression among the lobes of the ovary cleft at apex. Nutlets attached by the base (or by the side in *Trichostema*).

A. Flowers solitary in the axils; stamens 4.

Calyx with entire lips, a gibbous protuberance on the upper side. 2. SCUTELLARIA.

Calyx not gibbous on the upper side (nor in any of the following).

Trailing herb; flowers very small. 12. MICROMERIA.

Shrub; flowers large. 13. SPHACELE.

B. Flowers in whorls or terminal heads or axillary cymes.

1. *Calyx regular, or its teeth nearly equal (except some species of Mentha).*

Stamens with the exerted portion of filaments as long or longer than the corolla, conspicuously curved; tube of corolla slender, abruptly curved below throat; ovary 4-lobed; nutlets attached by the side. 1. TRICHOSTEMA.

Stamens moderately exerted or included; ovary 4-parted; nutlets attached by the base.

Corolla little irregular.

Flower-whorls axillary.

Stamens 4; stems obtusely quadrangular; herbage aromatic. 17. MENTHA.

Stamens 2; stems acutely quadrangular; herbage little aromatic. 16. LYGOPUS.

Flowers in terminal bracted heads; segments of the corolla narrow and very similar; stamens 4. 14. MONARDELLA.

Corolla plainly bilabiate; stamens 4.

Stamens included in the tube of the corolla; calyx-teeth 10, subulate, hooked at tip; flowers in whorls. 3. MARRUBIUM.

Stamens projecting beyond the tube.

Inferior (lower) pair of stamens longer than the superior; calyx tubular-campanulate, its teeth triangular, cuspidate; corolla-tube with a hairy ring within; flowers in whorls. 7. STACHYS.

Stamens nearly equal; calyx tubular, its teeth very short, densely woolly; flower-whorls remote, mostly leafy-bracted. 15. KOELLIA.

Superior (upper) pair of stamens longer than the inferior; calyx-teeth lanceolate, cuspidate, often pinkish; flowers in a dense spike. 5. LOPHANTHUS.

2. *Calyx bilabiate or its teeth unequal.*

Superior (upper) pair of stamens longer than the inferior; calyx-teeth lanceolate-subulate. 4. NEPETA.

Inferior (lower) pair of stamens longer than the superior or latter wanting.

- Flowers in a dense terminal spike, with roundish bracts; upper calyx-lip truncate with 3 cusps on the margin; stamens 4. . . 6. *BRUNELLA*.
- Flowers in whorls in a close spike or some of the lower whorls distinct; bracts narrow, obspatulate or linear; lower calyx-lip of 2 lanceolate-subulate teeth longer than the 3 upper teeth; stamens 4 (or 2); style bearded above; annuals. 10. *POGOGYNE*.
- Flower-whorls distinct, commonly remote.
- Stamens with anthers 4; flowers in axillary clusters; calyx in fruit deflexed. 11. *MELISSA*.
- Stamens with perfect anthers 2; upper pair of stamens none, rudimentary, or with imperfect anthers.
- Anther-cells without filament-like connective; bracts roundish, the margins armed with long needle-like spines. . . 9. *ACANTHOMINTHA*.
- Anther-cells one at each end of a long versatile connective or cross-bar which is attached near the middle to the filament proper, a perfect anther-cell at the upper end, the anther-cell at the lower end imperfect or none, or even the lower portion of the connective obsolete. 8. *SALVIA*.

1. *TRICHOSTEMA* L. BLUE CURLS.

Ours ill-scented annuals with entire leaves and blue (occasionally pinkish or whitish) flowers in axillary cymes or becoming raceme-like in age. Calyx equally or almost equally 5-cleft. Corolla with oblique limb, the oblong lobes nearly alike; tube in ours slender, far exceeding the calyx and abruptly geniculate or curved into an arc of a circle just below the limb. Stamens with the anther-cells divaricate; filaments capillary, blue or violet, spirally coiled in the bud, in anthesis very much exerted, ascending between the deeply parted upper lobes of the corolla and curved outward and downward. Nutlets rugose-reticulate. (Greek *trichos*, hair, and *stemon*, stamen.)

Stems densely leafy; leaves sessile. 1. *T. lanceolatum*.
 Stems sparsely leafy; leaves petioled. 2. *T. laxum*.

1. *T. lanceolatum* Benth. VINEGAR WEED. Annual, simple or branching from near the base, 6 to 11 in. high, very leafy; herbage cinereous or villous-pubescent and minutely glandular; leaves lanceolate, acuminate, sessile, or the lowest subsessile, with 3 to 5 strong almost parallel nerves or ribs, 1 in. long; cymes short-peduncled or nearly sessile; calyx villous; corolla almost filiform, somewhat pubescent.

Dry plains and low hills throughout the Coast Ranges: Southern California to Saratoga, Los Gatos, Alvarado, Lafayette, Vacaville. Winters, Healdsburg and northward. Sierra Foothills. A bee plant in Fresno Co., where it abounds in many localities and "yields a white honey that granulates remarkably quick," *O. L. Abbott*. Aug.-Sept.

2. *T. laxum* Gray. BLUE CURLS. Simple or branching, 1 ft. high or less, minutely pubescent, sparsely leafy; leaves lanceolate or oblong-lanceolate, acuminate but obtusish, pinnately veined, 1 to 1½ in. long, on slender petioles; cymes peduncled, rather loose; corolla almost glabrous.

Stream beds or low summer fields of the North Coast Ranges: Sonoma Co.; Pope Valley, Napa Co.; Putah Creek and northward. Also inner South Coast Ranges acc. to Greene. Aug.-Sept.

T. LANATUM Benth. is a shrub with purple-woolly spikes.—Monte-rey Co. and southward. *T. OBLONGUM* Gray has sessile flowers, the corolla hardly surpassing the calyx.—Sierra Nevada at middle altitudes.

2. SCUTELLARIA L. SKULL-CAP.

Ours perennial herbs, the flowers always solitary and either in axillary pairs or, when the leaves are reduced, forming terminal spikes or racemes. Calyx bilabiate, both lips entire, the upper with a scale-like or crest-like projection on the back, in anthesis campanulate, after anthesis closed, and in fruit splitting to the base. Corolla with a long-exserted tube naked within; upper lip galeate, entire or barely notched, the lateral lobes of the lower lip more or less attached to it so that it appears 3-lobed, the middle lobe seeming to constitute the whole lower lip. Anthers ciliate-pilose. Upper fork of style short or none. Nutlets rarely wing-margined. Embryo curved; caulicle short, incumbent. (Latin *scutella*, a dish, on account of the conspicuous protuberance on the fruiting calyx.)

Rootstocks filiform, bearing tubers; flowers violet-purple. . 1. *S. tuberosa*.
Rootstocks not tuber bearing; flowers whitish. 2. *S. Californica*.

1. *S. tuberosa* Benth. BLUE SKULL-CAP. Stems 3 to 5 in. high, from tuberous rootstocks, the tubers oblong, 3 to 8 lines long; herbage pubescent; leaves thin, few-toothed; radical and lower leaves oval, purplish beneath (as also the lower cauline), on petioles as long as the blade; upper cauline ovate, the petioles commonly short; corolla violet-purple, 7 to 9 lines long; middle lobe of lower lip somewhat spreading, much larger than the galeate upper lip; nutlets muricate.

Loamy soil of shady woods in the hills or in sandy valleys: Napa Valley; Marin Co.; San Francisco; West Berkeley; Alameda; Walnut Creek; Mt. Diablo; Loma Prieta; Southern California. Apr.—May. Not reported from the inner North Coast Ranges, nor from the inner South Coast Ranges south of Mt. Diablo. The var. *SIMILIS* has a very densely-villous calyx.—Pope Valley grade from Calistoga.

2. *S. Californica* Gray. SKULL-CAP. Stems clustered, commonly simple, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. high, from horizontal branching rootstocks; herbage puberulent; leaves $\frac{3}{4}$ to 1 in. long, oval-ovate or oblong-lanceolate, the lower disposed to be crenate and purplish beneath, the upper narrower and entire, those subtending the flowers much reduced; petioles 1 to 3 lines long; corolla nearly white or slightly yellowish, the throat ampliate-inflated, and the lips not very unequal; lower lip villous-bearded within; nutlets rugulose.

Open woods and borders of thickets, on hillsides and in ravines: Coast Ranges (Berkeley; Ukiah; Anderson Valley); Sierra Nevada. June.

S. BOLANDERI Gray and *S. ANGUSTIFOLIA* Pursh are of the Sierra Nevada: the former has oval leaves, little reduced above, sessile by a cordate base and very veiny, and whitish flowers; the latter has linear or lanceolate entire leaves (or the lowermost broader and serrate) and violet-purple flowers.

3. **MARRUBIUM** L. HOREHOUND.

Perennial tomentose herbs with much wrinkled leaves and rather small flowers in whorls. Calyx with cylindraceous tube, 10 ribs and as many equal subulate or spinulose teeth, which are recurved at tip. Corolla white, with short tube included in the calyx, the upper lip erect, 2-cleft, the lower spreading, 3-cleft. Stamens 4, included within the tube of the corolla, all the anthers 2-celled. Nutlets rounded at the top. (From Hebrew, meaning bitter.)

1. **M. vulgare** L. COMMON HOREHOUND. Stems tufted, erect, white-woolly, $\frac{3}{4}$ to 2 $\frac{1}{4}$ ft. high; leaves roundish, crenate, except at the cuneate or truncate base, petioled, white-woolly beneath and green above, or somewhat tomentose on both faces; middle lobe of lower lip of corolla transversely oblong, much larger than the lateral lobes.

Common weed of old fields and waste places about farms and villages everywhere in the Coast Ranges, Sacramento and San Joaquin Valleys, Sierra Foothills and Southern California. Evergreen with us. July–Sept.

4. **NEPETA** L.

Perennial herbs. Calyx tubular, obliquely 5-toothed, the upper teeth longer than the lower. Corolla-tube enlarged above, distinctly bilabiate; upper lip erect, lower spreading, the middle lobe larger than the lateral. Stamens 4, not exserted, ascending under the upper lip, the lower pair the shorter, all anther-bearing, with the anthers approximate in pairs. Nutlets ovoid, flattened, smooth. (Old Latin name used by Pliny, perhaps from the city Nepete in Tuscany.)

1. **N. cataria** L. CATNEP. Stems 2 or 3 ft. high; herbage canescent with fine hairs, except the green upper surface of the leaves; leaves triangular-ovate, truncate or cordate at base, coarsely crenate, 2 or 3 in. long or the upper reduced, greener above than below, petioled; spikes 1 to 3 in. long, dense or with 1 or 2 accessory whorls below; calyx-teeth lanceolate-subulate; corolla white, 4 or 5 lines long, dotted with purple.

Common in the North Coast Ranges but mostly beyond our limits: Russian River Valley; Scott Valley and Uncle Sam Mt., Lake Co. July.

5. **LOPHANTHUS** Benth.

Tall perennial herbs. Leaves ovate, serrate, petioled. Flowers violet-purple or whitish, crowded in a terminal spike. Calyx tubular-campanulate, rather oblique, almost equally 5-toothed. Upper lip of corolla 2-lobed, nearly erect; lower lip spreading, its middle lobe crenate. Stamens 4, exserted, the anthers not approximate in pairs. (Greek *lophos*, crest, and *anthos*, flower.)

1. **L. urticifolius** Benth. Glabrous or nearly so, 3 or 4 ft. high; calyx-lobes membranaceous, pinkish or whitish; corolla light violet-purple.

Common in the Sierra Nevada and in the Yalho Bally Mountains

of the North Coast Ranges. Rare within our limits: Caux's Knob, west of St. Helena; Russian River Station; Skaggs' Springs.

6. **BRUNELLA L. SELF HEAL.**

Low perennials, the nearly simple stems terminated by a short-spicate or subcapitate inflorescence, each whorl composed of six subsessile flowers and subtended by broad floral bracts. Calyx reticulate-veiny, membranaceous or chartaceous, bilabiate; upper lip truncate with 3 cusps; lower 2-cleft; lips closed in fruit. Corolla-throat inflated and tube more or less exserted; upper lip erect, galeate, entire; lower lip 3-lobed, the middle lobe hanging downward. Stamens 4, in pairs under the upper lip, each filament or those of the upper with a small tooth below the anthers. Nutlets smooth and glabrous. (Derived from the Old German Breune or Braune, an affection of the throat, which Self Heal was used to cure.)

1. **B. vulgaris L.** Four to 10 in. high, green and nearly glabrous; leaves oblong to ovate-lanceolate, obscurely serrate, 1 to 3 in. long, petioled; corolla violet, pinkish or rarely white, exceeding the purplish calyx.

Woods of low hills and valleys near the coast: Marin Co.; Knight's Valley. June.

7. **STACHYS L. HEDGE NETTLE.**

Ours hispid or soft-pubescent herbs with the flowers few in the axils of the floral leaves, usually forming an interrupted spicate inflorescence. Calyx tubular-campanulate or turbinate, 5 to 10-nerved or -ribbed, with 5 nearly erect or spreading pointed equal teeth, sometimes the upper larger and more or less united. Corolla with cylindrical tube, not dilated at the throat; upper lip erect or slightly turned backward, over-arched or concave, entire or notched; lower lip longer, spreading, 3-lobed, the middle lobe larger, the lateral lobes often deflexed. Stamens 4, in pairs, ascending under the upper lip of the corolla, or one or both pairs sometimes deflexed to the sides of the throat and contorted after anthesis. Nutlets obtuse at the apex. (Greek *stachys*, an ear of corn, hence a spike; given to these plants on account of their spicate inflorescence.)

Corolla-tube little or not at all exceeding the calyx.

Flowers whitish.

Whorls forming a dense spike; herbage very hirsute. 1. *S. pycnantha*.

Whorls distinct or indistinct, the inflorescence 3 to 9 in. long; herbage white-woolly. 2. *S. albens*.

Whorls distinct, the inflorescence 2 to 4 in. long; herbage villous or silky-hirsute. 3. *S. ajugoides*.

Flowers purplish; stems retrorsely hispid or hirsute, especially on the angles.

Hairy ring at middle of corolla-tube very oblique. 4. *S. bullata*.

Hairy ring near base of corolla-tube horizontal. 5. *S. Californica*.

Corolla-tube much longer than the calyx, the corolla red. 6. *S. Chamissonis*.

1. **S. pycnantha Benth.** Erect, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. high; herbage mostly green but hirsute, the surface of the leaves somewhat granulate-glandular; leaves ovate to oblong-ovate, 1 to 4 in. long, obtuse or

subcordate at base, mostly petioled; flowers in a dense cylindraceous bractless or nearly bractless spike, 1 to 2 in. long; lowest whorls rarely separate; calyx-teeth deltoid, mucronate, commonly equaling the tube.

Rather uncommon: West Berkeley; Tiburon, and southward to Monterey.

2. *S. albens* Gray. Stems erect, strict, 2 to 5 ft. high, white-tomentose; leaves ovate to lanceolate, obtuse or cordate at base, mostly the very lowest short-petioled; whorls many-flowered, mostly indistinct and spicate, only the lowest whorls, if any, somewhat remote, the inflorescence 3 to 9 in. long; calyces often somewhat yellow-green, the teeth awn-pointed.

Along rivulets or near springs in the dry inner Coast Ranges: Knoxville Grade to Lower Lake; Livermore Pass; Pacheco Pass, July-Aug.

3. *S. ajugoides* Benth. Stems mostly erect, simple, 8 to 24 in. tall; herbage densely soft-pubescent, sometimes glabrate; leaves oblong, 1 to 2½ in. long, acute or obtuse below, petioled, the upper sessile; one or two flower clusters below rather remote and in the axils of upper ordinary leaves, the leaves above becoming bract-like and the clusters less remote; calyx short-campanulate or turbinate, very silky-villous, often concealing the teeth; hairy ring below middle of corolla-tube very oblique, the tube slightly constricted below.

Everywhere common in low lands in the Coast Ranges and Sacramento and San Joaquin Valleys. May-Aug.

Var. *stricta* (*S. stricta* Greene). Small resin-glands abundant beneath the short pubescence on the leaves; leaves thinnish, ovate-lanceolate or oblong, 3 to 3½ in. long, only the uppermost sessile; calyx-teeth erect or somewhat connivent around the tube of the corolla; upper lip of corolla very short.—In the original diagnosis, the lateral lobes of the lower lip are described as reduced to mere teeth. In specimens from Knight's Valley, the original locality, collected June 18, 1894, by Mr. Davy, the corolla is small but the lateral lobes are not any smaller relatively to the middle lobes of the lower lip than in the species. We discover, however, that the corolla tube has no evident constriction and the ring of hairs is horizontal, not oblique.

Var. *velutina* (*S. velutina* Greene). Pubescence short and close; leaves cordate-ovate; spike elongated, interrupted.—Suisun Marshes. Oct. This variety forms a transition to the preceding species.

4. *S. bullata* Benth. Stems simple from the base or branched above, erect or ascending, 10 to 22 in. long; foliage densely or sparsely hispid, the stems retrorsely hispid, especially on the angles; leaves oblong-ovate, sometimes varying to elliptic, coarsely crenate, truncate or subcordate at base, 1 to 2 or even 3½ in. long, the lower on petioles 1 to 2 in. long; flowers about 6 in a whorl, the whorls rather remote (mostly 6 to 12 lines apart); calyx turbinate or campanulate-

turbinate, the teeth triangular, cuspidate, in age spreading, somewhat indurated; corolla-tube 4 lines long, exerted about 1 line, bearing within at its middle an oblique ring of hairs interrupted on the upper side opposite the style and indicated exteriorly by a distinct although only partial constriction; filaments densely pubescent at the middle.

The most common species, found everywhere among the low hills of the Coast Ranges. Mar.-Apr.

5. **S. Californica** Benth. Slender, 2 to 4 ft. high; leaves ovate-oblong, ample, subcordate at base, sparsely villous-hispid; corolla-tube exceeding the calyx, nearly twice as long; hairy ring at base of tube horizontal.

Santa Cruz Mountains, in shady woods. June. We are not sure that this plant is identical with that of Benthams; our specimens do not answer in every particular to Benthams diagnosis and the original description is not altogether satisfactory.

6. **S. Chamissonis** Benth. Several ft. high, the angles of the stems retrorsely scabrous, the hairs pustulate; leaves soft-pubescent, ovate, 3 or 4 in. long; calyx $\frac{1}{2}$ in. long, clavate-tubular, much shorter than the tube of the red corolla; hairy ring near base of corolla-tube.

Near the coast: Sausalito, *Kellogg*; Bolinas Bay; Point Reyes Peninsula and northward; formerly at San Francisco, *Bolander*.

LAMIUM AMPLEXICAULE L. Henbit. Low annual, decumbent at base; internodes below the inflorescence very long; leaves rounded, toothed or lobed, the lowest petiolate, the floral sessile; calyx with 5 nearly equal awn-pointed teeth, much surpassed by the elongated corolla-tube; upper lip of corolla bearded, lower spotted.—Sonoma Co., *Bioletti*, 1892.

8. **SALVIA** L. SAGE.

Herbaceous or low-shrubby plants with the flowers usually in whorls, forming terminal racemes or spikes, the floral leaves mostly reduced to bracts. Calyx bilabiate, the upper lip entire or 3-toothed, the lower 2-cleft. Corolla with the upper lip erect, straight, concave or falcate, sometimes obsolete; lower lip spreading, 3-lobed, the middle lobe often emarginate, cleft or fringed. Stamens inserted in the throat of the corolla; anterior pair fertile; the posterior pair obsolete or represented by sterile filaments or vestiges; anther-cells widely separated on a long filament-like connective longer than the filament itself and jointed to it by the middle or near one end; connective at its upper end (under the upper lip of the corolla) bearing a perfect anther-cell, at its lower end a deformed anther-cell or the anther-cell obsolete. In some species the filament is seemingly simple, but is really jointed, indicating the presence of the connective, the lower end of which sometimes projects as a subulate point but never bears a trace of an anther-cell. (From the Latin, *salveo*, to save, some of the species being officinal.)

Lower end of connective bearing a deformed anther-cell or a rudiment; flower-whorls few; annuals.

Herbage white-woolly; bracts much surpassing the flowers; upper calyx-lip 3-toothed, the lateral distant from the middle one

1. *S. carduacea*.

Herbage green; bracts not exceeding the flowers; teeth of upper calyx-lip 2, awned, partly connate

2. *S. Columbariæ*.

Lower end of connective reduced to a subulate point or slender thread, the filament apparently simple; flower whorls several; perennials.

Corolla white, whitish, or violet-tinged.

• Low shrub; middle lobe of lower lip of corolla emarginate, otherwise entire; upper lip present

3. *S. mellifera*.

Low matted herb, only the scape-like flowering stems ascending; middle lobe of lower lip of corolla denticulate or fringed; upper lip obsolete.

4. *S. Sonomensis*.

Corolla crimson, $1\frac{1}{4}$ in. long or more; herbaceous, stems erect

5. *S. spathacea*.

1. ***S. carduacea* Benth.** THISTLE-SAGE. Herbage white-woolly, particularly in the flower whorls, the wool more or less deciduous; stems 1, 2 or 3 from a rosette of radical leaves, naked and scape-like, bearing 1 to 4 whorls of flowers, 4 in. to 2 ft. high; leaves oblong in outline, pinnatifid, with spinulose-dentate margin, the radical 6 in. long or less; bracts ovate-lanceolate or lanceolate, pectinate-spinescent, surpassing the flowers; calyx long-woolly, its upper lip strongly 3-toothed, the middle tooth larger, the lateral distant, much surpassing the lower lip; corolla light blue, deeply 2-lipped, 1 in. long; upper lip 2-cleft, the segments lacinate or denticulate at the end; lower lip with small erose lateral lobes and an exceedingly large fan-shaped and laciniately fringed middle lobe; proper filament very short.

Inner South Coast Range valleys (Contra Costa Co. and southward) and throughout the San Joaquin Valley; Southern California. June.

2. ***S. Columbariæ* Benth.** CHIA. Herbage finely pubescent, dark green; stems usually several from the base, commonly simple and bearing 1 or 2 pairs of leaves and 1 or 2 whorls of flowers, occasionally branching; leaves mostly radical or subradical, bipinnatifid, very rugose, petioled; bracts ovate or more commonly orbicular and broader than long, abruptly acuminate and cuspidate-tipped, not exceeding the flowers, often purple; fruiting calyx 5 lines long, oblique at the throat; upper lip arched, crowned with a pair of needle-like prickles, the prickle representing the middle tooth wanting; lower lip very much shorter, the teeth represented by 2 shorter prickles; corolla blue, little exceeding the calyx; upper lip emarginate; lower lip with small lateral lobes and a larger somewhat 2-lobed middle one.

Throughout the Coast Ranges, Sierra Nevada, and Southern California, on hill and mountain slopes. Apr.-May.

3. ***S. mellifera* Greene.** BLACK SAGE. Shrubby, 3 to 6 ft. high, with herbaceous flowering branches very leafy at the base; leaves narrowly oblong, petioled, $1\frac{1}{2}$ to 3 in. long, crenulate, green and rugulose above, cinereous-tomentulose beneath; flowering branches with about 5 rather small flower-whorls; leafy bracts oblong or ovate, those subtending the upper whorls much reduced; proper bracts ovate or

oblong, cuspidate; lower lip of calyx very short, the 2 teeth prickly; upper lip arched, crowned by 3 short sharp teeth; style and stamens little exserted; lower portion of connective in fertile stamens manifest at the joint as a subulate rudiment; upper pair of stamens represented by short sterile filaments, their tips approximate; corolla white or slightly lilac-tinged and rather small, exserted; upper lip notched; middle lobe of lower lip transversely oblong or orbicular, emarginate, and slightly denticulate, joined to the main part of the lip by a narrow constriction.—(*Audibertia stachyoides* Benth.)

Mount Diablo; Las Trampas Ridge; near Haywards; San Mateo Co.; Glenwood and Loma Prieta, southward to Southern California. Apr.—May.

S. CALIFORNICA (*Audibertia polystachya* Benth.), White Sage, is a shrubby species, often 8 ft. high, occurring from Santa Barbara to San Diego, and distinguished by its open paniculate inflorescence.

4. S. Sonomensis Greene. **RAMONA.** Plants more or less matted, the flowering stems almost leafless and scape-like, 4 to 8 in. high, ascending from a leafy decumbent or prostrate base; leaves green and rugulose above, whitish with a close dense tomentum beneath, oblong- or obovate-spatulate, crenulate, petioled, $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long; calyx like that of *S. mellifera* but the prickly teeth of the larger upper lip short; corolla light violet; upper lip short, of two erect or somewhat retrocurved lanceolate lobes; lower lip large, much prolonged in the direction of the tube, its lateral lobes acute, short, the middle with its orbicular-dilated terminal portion turned abruptly downward, its margin denticulate or somewhat fringed; upper (sterile) stamens inserted at orifice of tube, bristle-like, divergent; two lower (fertile) stamens inserted on lower lip without the orifice, ascending, straight (nearly as long as the corolla); style long exserted.—(*Audibertia humilis* Benth. *Ramona humilis* Greene.)

Montane species at middle altitudes: Sonoma; mountains west of Calistoga; Mt. Shasta; Calaveras and Mariposa Cos.; San Diego Co. May.

5. S. spathacea Greene. **CRIMSON SAGE.** Coarse strictly herbaceous plant, very viscid and glandular-pubescent or -villous; upper surface of leaves dark green, under surface whitened with a close short tufted tomentum; stems erect, simple, $1\frac{1}{2}$ to 2 ft. high; leaves broadly oblong-ovate, with broadly triangular-cordate base, more or less doubly crenate or crenulate, upper surface rugulose, 4 to 8 in. long, on petioles 2 or 3 in. long or some of the cauline sessile; whorls of flowers 5 or 6 or more, subtended by broadly ovate or ovate-lanceolate membranaceous purplish bracts; calyx strongly veined, laterally compressed but somewhat inflated, 1 in. long or over, $\frac{1}{2}$ in. wide at the broadest part, spathe-like, deeply slit in front between the two cuspidate-tipped teeth, the upper concave lip much larger, 3-dentate with the middle tooth largest; corolla crimson, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; upper lip short, nearly erect, emarginate; lower lip spreading, the lateral lobes short, triangular, acute, the middle lobe much developed, broadly obcordate, 4 lines broad; stamens much exserted; lower fork of the

connective capillary, 1 line long; rudiments of sterile stamens obvious. —(*Audibertia grandiflora* Benth.)

Coast Ranges from the Vaca Mountains, Mt. Diablo and San Francisco southward to Santa Monica. Apr.—May.

9. *ACANTHOMINTHA* Gray.

Annuals with dentate leaves and flowers in distinct or at length remote whorls, each whorl subtended by a pair of leaves and a circle of broad callous-margined bracts armed with needle-like prickles. Calyx bilabiate; upper lip 3-toothed, the teeth aristate; lower lip short, 2-cleft into oblong acute lobes. Corolla-tube exceeding the calyx, naked within; upper lip entire, oblong; lower lip 3-lobed, the middle lobe deeply and the lateral slightly emarginate. Stamens 4, inserted high in the ample throat; lower pair fertile; upper pair shorter with imperfect anthers. Nutlets smooth. (Greek *acantha*, thorn, and *Mentha*, Mint.)

1. *A. lanceolata* Curran. Stoutish, branching from the base, soft-pubescent, oily and ill-scented, 7 to 12 in. high; leaves oblanceolate or oblong, sparingly dentate, tapering at base into a slender petiole; bracts elliptic-ovate, 5 lines long, the aristate prickles 3 or 4 lines long; upper lip of corolla somewhat falcate-incurved, cleft at apex; lower with oblong entire lobes.

Alameda Co. (first collected in Calaveras Valley), southward in the Coast Ranges. June.

10. *POGOGYNE* Benth.

Low sweet-aromatic annuals with obovate or oblanceolate leaves narrowed into a petiole. Whorls crowded into dense spikes or the lower whorls distinct. Bracts and calyx hirsute. Calyx unequally and deeply 5-cleft, the two lower teeth longer; tube mostly 15-nerved; throat naked. Corolla straight, tubular-funnelform, blue or purplish; upper lip erect, entire; lower spreading, with 3 similar oval lobes. Stamens 4, with anthers, or the upper shorter pair sterile. Style somewhat exserted, in some (perhaps all) species flattened above and always bearded. (Greek *pogon*, beard, and *gune*, female, on account of the hairy style.)

All 4 stamens anther-bearing; corolla large, much longer than calyx; bracts conspicuously ciliate with white hairs.

Bracts linear, acute 1. *P. Douglasii*.

Bracts obtuse 2. *P. parviflora*.

Lower pair of stamens anther-bearing, the upper with mere rudiments of anthers or none; corolla about equaling (scarcely longer than) calyx; bracts sparsely hairy.

Plants very slender, diffuse 3. *P. serpylloides*.

Plants stoutish, erect 4. *P. ziziphoroides*.

1. *P. Douglasii* Benth. Commonly low (4 to 6 in. high) and branched from the base, oftentimes simple and as much as 2 ft. high; leaves oblanceolate or obovate and narrowed to a petiole, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; whorls forming a dense terminal spike, often with a single accessory whorl in the adjacent axil below, or sometimes several of the lower axils with flowers; bracts cuspidate, the margin ciliate with

white hairs; lower divisions of calyx twice longer than tube; corolla blue, the palate white, dotted with purple, bristly, 7 to 9 lines long; stigmas subequal; nutlets smooth, often mottled, minutely hispid at the apex.

Low fields: near Pajaro, *H. P. Chandler*; Mt. Diablo region; Berkeley; very abundant in the dry valleys of the North Coast Ranges, flowering in May or as late as July, often coloring large areas that were overflowed in the winter season. Style flattened above and hirsute-ciliate on the margins, as also in *P. ziziphoroides*.

2. *P. parviflora* Benth. More slender than the preceding; bracts mostly obtuse; calyx-teeth rather broad, the lower barely longer than the tube; corolla scarcely $\frac{1}{2}$ in. long.

About San Francisco Bay. A species little known to us.

3. *P. serpylloides* Gray. Stems many from the base, very slender, diffuse; leaves obovate-oval or spatulate, petioled, 2 to 4 lines long; whorls except the terminal ones distinct, the lower with few or even solitary flowers; bracts sparsely hairy; calyx-lobes all longer than the tube, equaling the violet or bluish corolla; corolla $1\frac{1}{2}$ to 2 lines long, short-pubescent outside; sterile stamens with rudiments of anthers or with none; style bearded above with a few coarse hairs; stigmas very unequal.

Common from Monterey to Humboldt Co. Also in the Sierra Nevada (Copperopolis) and Southern California. May.

4. *P. ziziphoroides* Benth. Stems short, commonly several from the base, 4 to 6 in. high; leaves obovate; bracts ciliate with white bristly hairs; whorls below distinct, with long internodes, above forming a short spike or sometimes capitate; corolla 3 to 4 lines long (the calyx-teeth distinctly shorter), light purple, the center of lower lip with white and dark purple markings; 2 lower stamens with large anthers, the 2 upper with very small anthers or none and with shorter filaments; stigmas very unequal.

Sacramento Valley in low ground: Willows, May 1, 1899.

11. MELISSA L.

Lemon-scented branching perennial, with broad dentate petioled leaves and white flowers in loose axillary clusters. Calyx narrowly campanulate, 13-nerved, deflexed in fruit; upper lip 3-toothed, the lower 2-parted. Corolla exserted, nearly twice as long as the calyx, bilabiate, the upper lip erect, notched; lower lip spreading, 3-cleft. Stamens 4, converging under the upper lip. (Greek melissa, a bee, these insects visiting the flowers for honey.)

1. *M. officinalis* L. GARDEN BALM. Stems somewhat decumbent at base, $\frac{1}{4}$ to 2 ft. high; stems and petioles short-villous; leaves hispidulous above, truncate at base, $2\frac{1}{2}$ in. long or less, the petiole $\frac{1}{3}$ to $\frac{1}{2}$ as long; calyx-teeth unequal; corolla 5 lines long.

Sparingly naturalized: near San Rafael; Palo Alto Creek, Marin Co., *Congdon*; Santa Rosa; Guerneville.

12. **MICROMERIA** Benth.

Trailing perennial herbs. Flowers small, white, solitary and pediceled in the axils. Calyx tubular, about equally 5-toothed and striately 12 to 15-nerved. Corolla evidently bilabiate, the tube straight, shorter than or somewhat exceeding the calyx. Stamens 4, all anther-bearing, shorter than the corolla. Style beardless. (Greek mikros, small, and meros, part, on account of the small size of the flowers.)

1. **M. Chamissonis** (Benth.) Greene. YERBA BUENA. Trailing or creeping stems slender, 1 ft. or more long; herbage slightly pubescent; leaves round-ovate, crenate, glandular-punctate, especially on the under surface, 1 in. long or less, on petioles 2 to 3 lines long; flowers about 4 lines long; calyx minutely hispidulous; corolla exteriorly pubescent.—(*M. Douglasii* Benth.)

Common in woods near the coast: Humboldt Co.; Marin Co.; Berkeley; San Francisco; Belmont; Monterey Co. and southward to Southern California. June.

13. **SPHACELE** Benth.

Ours a low shrub or merely suffrutescent plant. Flowers solitary in the axils of the reduced upper leaves thus forming a leafy raceme. Calyx campanulate, deeply and nearly equally 5-toothed, naked within, about 10 to 15-nerved, reticulate-veiny, inflated and membranous after flowering. Corolla large and rather showy, with 4 short spreading lobes, the fifth and lowest lobe much longer and erect; tube broad, a hairy ring at base within. Stamens 4, somewhat ascending; filaments naked; anthers somewhat approximate, the cells diverging. (Sphakos, the name of the Greeks for Sage, the plants of this genus having similar foliage.)

1. **S. calycina** Benth. PITCHER SAGE. Three or 4 ft. high, pubescent or even somewhat woolly; leaves very veiny or scarcely reticulated, broadly ovate to oblong-ovate, obtuse, dentate or serrate, the base entire and varying from cordate to acute, 2 to 4 in. long, the lower on petioles $\frac{1}{2}$ in. long, the uppermost sessile; corolla white or pink-tinted, over 1 in. long; calyx with triangular-lanceolate lobes, in fruit ovoid-inflated, $\frac{3}{4}$ to over 1 in. long; nutlets black, very smooth, elliptical in outline, nearly 2 lines long.

Hillside and cañons of the Coast Ranges: Vaca Mountains; Marin Co.; Mt. Diablo; Belmont; Monterey, and southward to Southern California. Butte Co., acc. to Bot. Cal. May–June. On the higher ridges the leaves are small and very rugose.

14. **MONARDELLA** Benth.

Annual or perennial herbs, for the most part pleasantly fragrant. Flowers in heads; heads terminal on the branches or stems, subtended by broad involucrel bracts, which are often more or less colored. Calyx tubular, narrow, 15-nerved, the 5 teeth equal or nearly so. Corolla glabrous within, rose-purple, lavender or dull white; upper

lip erect, 2-cleft, the lower 3-parted, all the lobes linear or narrowly oblong. Stamens 4, all fertile, strongly or moderately unequal, exserted, distant and straight. (Diminutive of *Monarda*, on account of its resemblance to that genus.)

Annuals.

Leaves entire; interior species or at least not of the seaward ranges.

Bracts with strong transverse ribs from the midrib to the conspicuous marginal nerve, the spaces between the ribs silvery-scarious or transparent; corolla-tube little exserted 1. *M. Douglasii*.

Bracts whitish-scarious, the ribs converging toward the apex, at least in the inner bracts; corolla-tube much surpassing the calyx 2. *M. Breweri*.

Leaves undulate; seacoast species 3. *M. undulata*.

Perennials.

Leaves ovate to lanceolate, green on both faces, mostly serrate 4. *M. villosa*.

Leaves rhomboidal to oblong, green on the upper, white on the lower face, entire 5. *M. viridis*.

1. *M. Douglasii* Benth. Four to 10 in. high, nearly glabrous, loosely branched; leaves narrowly oblong or lanceolate, abruptly short-petioled, the whole about 1 in. long; heads on terminal or axillary peduncles; bracts ovate and ovate-lanceolate, cuspidate, with strong pinnate ribs which are confluent along the margin, the spaces between them silvery-scarious; corolla deep purple, the tube little exserted beyond the cuspidate triangular-lanceolate calyx-teeth.

Alameda and Contra Costa Cos.: Alameda, *G. R. Vasey*; depressions in the Oakland Hills and Moraga Valley. "odor very strong," *Bolander*; and eastward to Mt. Diablo. Remarkable for its fenestrate bracts.

2. *M. Breweri* Gray. Six in. high, finely scabrous-pubescent; leaves oblong or narrowly ovate, short-petioled, the lower over 1 in. long; bracts broadly ovate, abruptly acuminate-cuspidate, whitish-scarious, the outer pinnately 7 to 9-ribbed, the inner with the ribs parallel and converging to the point; calyx-teeth triangular-lanceolate, not cuspidate; corolla rose-color or rose-violet, the tube much surpassing the calyx.

Corral Hollow (inner South Coast Ranges), "top of very dry sandy hill; plant very fragrant," *Brewer*, no. 1213, June 3, 1862.

M. LANCEOLATA Gray. Bracts herbaceous, often turning reddish; calyx-teeth merely acute; corolla rose-purple.—Sierra Foothills or at middle elevations. *M. CANDICANS* Benth. Bracts ovate, with parallel greenish nerves and white-scarious margins; calyx-teeth white, acute, flowers white.—Sierra Foothills. *M. LEUCOCEPHALA* Gray. Very similar to the last, but the bright white bracts are more nearly orbicular and the calyx-teeth are subulate, rough-hispidulous, and recurved.—Merced plains of the San Joaquín Valley.

3. *M. undulata* Benth. Loosely branched, 5 to 9 in. high; stems reddish brown, puberulent; leaves thickish, oblong-oblancoelate or linear, obtuse, narrowed at base, undulate-margined, $1\frac{1}{4}$ in. long or less; bracts villous, broadly ovate or almost round, thin, and somewhat scarious, whitish or pinkish, obtuse or acute, without cross

veinlets between the parallel nerves; calyx-teeth triangular, or somewhat oblong, not cuspidate; corolla rose-purple.

Hills near the sea: Pt. Reyes, *Dary*, southward to Southern California. June.

4. **M. villosa** Benth. Stems mostly simple, clustered, tough or somewhat suffrutescent at base, $\frac{3}{4}$ to $1\frac{1}{2}$ ft. high; herbage finely pubescent; leaves green on both faces, round-ovate to lanceolate, entire or more commonly serrate, $\frac{1}{2}$ to 1 in. long, on petioles 2 or 3 lines long; bracts ovate, foliaceous, pinnately veined; flowers purple to pink, or dull white.

Coast Ranges on dry rocky hills; in typical form near the sea at San Francisco, Monterey and the Santa Lucia Mountains. Varying greatly in pubescence, foliage and general aspect. Var. **INTERIOR**. Leaves coarsely few-toothed, the teeth sometimes salient; heads large.—Vaca Mountains, Solano Co.

5. **M. viridis**. Suffrutescent, diffuse, the stems 2 or 3 ft. long; leaves rhomboidal to oblong-obtusish, narrowed at base to a slender petiole, the whole $\frac{1}{2}$ to $1\frac{1}{4}$ in. long, bright green on the upper face, white-lanate on the lower; heads on long and almost naked peduncles; bracts thick; flowers lavender-color.

Upper Conn Valley, Napa Co., Oct., 1894.

15. **KOELLIA** Mœnch. MOUNTAIN MINT.

Glabrous or canescent perennial herbs with white flowers in densely crowded whorls, the whorls remote and leafy-bracted or the uppermost subtended by a pair of somewhat reduced leaves. Calyx oblong or tubular, its teeth equal. Corolla-tube little exceeding the calyx; upper lip almost entire; lower 3-cleft. Stamens 4, nearly equal. (Dedicated to Koelle, a German botanist of the 18th century.)

1. **K. Californica** (Torr.) Kuntze. Simple, erect, 2 to $3\frac{1}{2}$ ft. high; leaves ovate to ovate-lanceolate, sessile, serrulate along the sides, the acuminate apex and rounded or cordate base entire, $3\frac{1}{2}$ in. long or less; calyx pubescent, the tips of the teeth very woolly exteriorly; corolla sprinkled exteriorly with resin dots.—(*Pycnanthemum Californicum* Torr.)

Sierra Nevada and Coast Range Mountains. July–Aug.

16. **LYCOPUS** L. WATER HOREHOUND.

Perennials of low grounds or river marshes, similar to *Mentha*, but bitter and much less aromatic. Flowers small, white or whitish, in sessile capitate glomerules, apparently whorled the upper axils flowerless. Calyx campanulate, 4 to 5-toothed (naked in the throat). Upper lobe of corolla entire. Fertile stamens 2, the upper pair without anthers, the tips of the filaments in ours thickened. Nutlets with thickened margins. (Greek *lukos*, wolf, and *pous*, foot, perhaps on account of the shape of the leaves in the original species.)

Leaves petioled, irregularly and incisely toothed 1. *L. Americanus*.
Leaves sessile, regularly serrate 2. *L. lucidus*.

1. **L. Americanus** Muhl. Stem erect, branching above, 2 to 3 ft. high, very acutely 4-angled, from creeping rootstocks, not bearing stolons; herbage nearly glabrous; leaves broadly or narrowly lanceolate, incisely toothed or laciniate-pinnatifid, narrowed at base into a slender petiole, $1\frac{1}{2}$ to 2 in. long; calyx-teeth acute; rudiments of sterile stamens conspicuous; inner angle of nutlet granulose at apex. —(*L. sinuatus* Ell.)

Lower Sacramento River; San Francisco acc. to Mrs. K. Brandegee. Sept.—Oct.

2. **L. lucidus** Turcz. Stems stoutish, not so sharply angled, perennial by stolons; leaves broadly or narrowly oblong, coarsely and incisely toothed, sessile, the lower 3 in. long and $\frac{3}{4}$ in. wide, the upper reduced; calyx-teeth attenuate-subulate.

Salt marshes, at Benicia; near San Francisco acc. to Bot. Cal. Aug.

17. MENTHA L. MINT.

Very odorous perennial herbs, mostly with slender creeping rootstocks, usually tomentose or hairy and with rather small flowers in whorls, which are either remote or spicate or capitate. Calyx campanulate or short-tubular, commonly 5-toothed, either regular or irregular or bilabiate. Corolla with a short tube; upper lip emarginate, scarcely or not at all larger than the 3-lobed lower one. Stamens 4, erect and nearly equal. Nutlets smooth. (Ancient Greek name.)

Flower-whorls in the leaf axils, distinct.

Herbage commonly light green; branches leafy to the ends; calyx-teeth similar and equal or nearly so 1. *M. Canadensis*.

Herbage somewhat grayish; leaves toward the end of the branches reduced and inconspicuous; calyx-teeth dissimilar, the 2 lower lanceolate-subulate 2. *M. Pulegium*.

Flower-whorls in terminal spikes or some in the upper leaf axils.

Leaves petioled; spike thick, dense or little interrupted . 3. *M. piperita*.

Leaves sessile or nearly so; spikes slim, mostly interrupted. 4. *M. spicata*.

1. **M. Canadensis** L. TULE-MINT. Perennial by suckers; stems often several ft. long, simple or much branched; herbage tomentose-pubescent, sometimes almost hoary, more commonly greenish; leaves oblong-lanceolate, sharply serrate, tapering at base into a petiole, $1\frac{1}{2}$ to 2 in. long; whorls of flowers often shorter than the petioles of the leaves; calyx pubescent, its teeth $\frac{1}{4}$ to $\frac{1}{3}$ as long as the tube.

Common in marshes: Lower Sacramento and Lower San Joaquin; San Francisco Bay. Aug.—Sept. Cymes sometimes raised out of the axils on peduncles.

2. **M. Pulegium** L. PENNYROYAL. Stems 1 to 2 ft. long, erect or prostrate and rooting at the joints; herbage pubescent with short white hairs; leaves elliptic- to oblong-ovate, serrate or entire, petioled, $\frac{1}{2}$ to 1 in. long; whorls dense, the leaves smaller or inconspicuous toward the ends of the branches; 3 upper calyx-teeth triangular, acute; 2 lower lanceolate-subulate, ciliate-bristly.—(*Micromeria purpurea* Gray.)

Introduced European mint: Sonoma Co.: Palo Alto Creek, Marin Co., *Congdon*; islands of the Lower San Joaquin.

3. **M. piperita** L. PEPPERMINT. Stems erect, strict and unbranched below the terminal inflorescence; herbage glabrous; leaves ovate-oblong to oblong-lanceolate, acute, sparsely and sharply serrate, distinctly petioled; spikes dense, scarcely interrupted; calyx resinous-glandular; corolla white with a pink tinge.

Along streamlets in low fields: West Berkeley; Haywards; Alvarado. Sept. Naturalized.

M. CITRATA Ehrh. Leaves rounded and flowers in a terminal head with a few whorls.—West Berkeley, acc. to Greene.

4. **M. spicata** L. SPEARMINT. Similar to the preceding; leaves sessile or subsessile; flower whorls crowded in a narrow leafless spike, commonly interrupted; calyx campanulate, its teeth subulate, nearly as long as tube.—(*M. viridis* L.)

Rather common in wet places: Berkeley; Napa Valley; Lake Co. Naturalized.

95. RUBIACEÆ. MADDER FAMILY.

Shrubs or herbs with opposite or whorled entire leaves. Flowers perfect or polygamous, rarely unisexual. Calyx-lobes or -teeth, corolla-lobes and stamens 4, except *Sherardia*. Calyx coherent with the 2 to 5-celled ovary, its limb sometimes obsolete. Stamens alternate with the lobes of the corolla and inserted on its tube. Embryo in fleshy or horny albumen. A very large order including the Cinchona and Coffee Plant. *Keiloggia galioides* of the Sierras has a perennial root, opposite leaves with interposed stipules, greenish yellow corolla 3 lines long, and densely uncinat-hispid fruits.

Herbs or slightly suffrutescent plants.

Corolla rotate; flowers in cymes or solitary, pediceled. . . 1. *GALIUM*.

Corolla funnellform; flowers in involucrate heads . . . 2. *SHERARDIA*.

Large shrub; corolla tubular-funnelform; flowers in dense globose long-peduncled heads . . . 3. *CEPHALANTHUS*.

1. *GALIUM* L. BEDSTRAW. CLEAVERS.

Herbs or some species slightly suffrutescent, with slender square stems. Leaves exstipulate, in whorls. Flowers cymose, peduncled. Calyx-limb obsolete. Corolla rotate, 4-cleft. Stamens 4, short. Ovary 2-lobed, 2-celled, 2-ovuled. Fruit didymous, of two globular halves, dry or fleshy, separating when ripe into 2 seed-like indehiscent 1-seeded carpels. (Greek gala, milk, certain species being used to curdle milk.)

A. Annuals.

Mature fruit dry; leaves 6 to 8 in a whorl.

Pedicels curved in fruit. 1. *G. tricornne*.

Pedicels straight in fruit.

Fruit granulate or tuberculate but glabrous. 2. *G. Parisiense*.

Fruit densely uncinat-hispid. 3. *G. Aparine*.

B. Perennials.

Mature fruit dry.

Leaves 6 in a whorl, cuspidate-acuminate 4. *G. triflorum*.

Leaves 4 or 5 in a whorl, obtuse at apex. 5. *G. trifidum*.

Fruit fleshy or berry-like; leaves in whorls of 4.

Herbaceous; corolla yellowish	6. <i>G. Californicum</i> .
Suffrutescent; corolla white	7. <i>G. Nuttallii</i> .
Herbaceous; corolla purple.	8. <i>G. Bolanderi</i> .
Prostrate; corolla white.	9. <i>G. Andrewsii</i> .

1. *G. tricornes* With. CORN GALIUM. Stems stout, rather simple, 6 to 10 in. long, the angles callous, with stoutish recurved prickles; leaves in whorls of 6 to 8, narrowly oblanceolate or linear, callous-margined and thickly beset with recurved prickles, about 6 lines long; fruit on stout recurved pedicels, $1\frac{1}{2}$ lines long, papillate-rugose, 2 lines broad or more.

Naturalized from Europe: reported only from Kenwood, Sonoma Co. Fruiting in June.

2. *G. Parisiense* L. WALL GALIUM. Much branched from the base, the branches and particularly the branchlets very slender or almost filiform, 10 to 16 in. high, very leafy below, less so above, finely scabrous; leaves in whorls of 6, oblong-spatulate or linear-oblong, acute, 3 to 5 lines long; cymes several-flowered, paniculate, the peduncles and pedicels filiform; flowers whitish, very small, $\frac{1}{4}$ to $\frac{1}{2}$ line broad; fruit small, glabrous, granulate.—(*G. anglicum* Huds.)

Abundant in vineyards at Sonoma. Introduced from Europe. July.

3. *G. Aparine* L. GOOSE GRASS. Diffuse or climbing over herbaceous plants and forming rather thick coarse mats, the stems 1 to 2 or 3 ft. long, the whole herbage setulose or hispidulous-roughened; leaves in whorls of 7 or 8, oblong-oblanceolate, obtuse, or the upper acute, mucronate, tapering to a rather narrow base, $\frac{1}{2}$ to $1\frac{1}{4}$ or 2 in. long; flowers white or whitish; fruit thickly beset with whitish hooked bristles.

Common in half shaded or grassy places among the hills. Apr. Fr. in May.

4. *G. triflorum* L. SWEET-SCENTED BEDSTRAW. Decumbent or reclining, with numerous mostly simple stems from the base, 7 to 12 in. long, retrorsely scabrous on the angles or smoothish; leaves mostly in 6's, oblong-oblanceolate, rather abruptly bristle-pointed, the midrib and the upper surface near the margin somewhat scabrous, 3 to 6 lines long; axillary peduncles once di- or tri-chotomous, 3 to 6 lines long; pedicels bractless, but the pedicels of the terminal peduncles with mostly whorled bracts; corolla purplish or greenish; fruit 1 line or less broad, beset with slender hooked bristles; endosperm lunate in cross-section.

Edges of woods: Coast Ranges (San Mateo, Kellogg, and northward); Sierra Nevada.

5. *G. trifidum* L. Stems slender and weak, ascending, 5 to 18 in. high, the angles comparatively smooth; leaves in whorls of 4 or 5, thin, oblong, obtuse, not bristle-pointed, obscurely scabrous on the margins, $1\frac{1}{2}$ to 6 lines long; flowers minute; peduncles mostly scattered; fruit smooth; endosperm annular in cross-section.

Coast Ranges (but not common); Sierra Nevada.

6. **G. Californicum** H. & A. CALIFORNIA GALIUM. Stems from slender rootstocks, erect and numerous, forming a low tuft, 6 to 8 in. high, or diffuse and 1 ft. long; herbage hispid with widely spreading stiff hairs; leaves thinnish, ovate or oval, apiculate-acuminate, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the margins and midrib hispid-ciliolate; flowers diœciously polygamous, the fertile solitary on short peduncles at the branches or in the forks, the sterile ones terminal in 3's; corolla yellowish with ovate-lanceolate lobes; fruit purple, glabrous or nearly so.

Common on open hills of the Coast Ranges: Humboldt Co., *Marshall*; Howell Mountain; Oakland, *Holder*, and southward to Southern California. A form from Pilarcitos Lake, San Mateo Co., *Dary*, is very hispid-bristly.

7. **G. Nuttallii** Gray. Suffrutescent, often climbing 2 to 5 ft. high on bushes, glabrous and nearly smooth, the angles of the stem and margins of the leaves roughened or hispidulous; leaves in whorls of 4, thickish, oval to linear-oblong, mucronulate or obtuse, mostly $1\frac{1}{2}$ to 2 or sometimes 3 lines long; fruit smooth and glabrous, purple, 2 lines broad.

Common in thickets: Cloverdale, *Setchell*; Mt. Diablo; Berkeley Hills and southward. Mar. Leaves with revolute margins, sometimes quite smooth.

8. **G. Bolanderi** Gray. Erect, stems 10 to 14 in. high, forming a thick tuft; angles of the stems scabrous; leaves oblong, acute, usually narrowed at base, hispid-ciliate, 2 to 3 (or the lower 4) lines long; cymes several-flowered, paniculate; pedicels about the length of the flowers, in fruit recurved or arcuate; corolla deep red-purple, with ovate acute lobes; ovary glabrous, rugose.

Coast Ranges: Collins' Camp, Vaca Mountains, *Jepson*; Hood's Peak, Sonoma Co., *Bioletti*. Also in the Sierra Nevada.

9. **G. Andrewsii** Gray. Densely matted on the ground, the prostrate stems rooting at the joints, 2 to 4 in. long; herbage grayish, sparsely scabrous or smooth; leaves crowded and fasciated in the axils, in whorls of 4, subulate, pungent, rigid, 2 to 4 lines long; flowers solitary or in 3's, terminating the branchlets, very small, perfect; corolla white; fruit on short somewhat recurved pedicels, 1 to $1\frac{1}{2}$ lines wide, glabrous.

High dry ridges of the inner Coast Ranges: Knoxville Grade, northeastern Napa Co., *Jepson*; Mt. Diablo, *Bioletti*; Monterey County, *Hickman*, and southward.

2. SHERARDIA L.

Slender annual with square stems and whorled exstipulate leaves. Flowers small, blue or pinkish, in heads surrounded by a deeply divided involucre. Calyx-limb of 4 to 6 teeth, which grow after flowering and crown the fruit. Corolla funnelform, the limb 4 or 5-lobed. Stamens 4 or 5. Style filiform, 2-cleft; stigmas capitate. Fruit dry, didymous, of 2 indehiscent 1-seeded carpels. (Dr. William Sherard, a patron of Dillenius.)

1. *S. arvensis* L. FIELD MADDER. Three to 6 in. high, hispidulous-roughened or nearly glabrous; leaves in whorls of 4 to 6, lanceolate to oblong, pungent; flowers subsessile, 2 or 3 in a head; involucre in fruit 3 to 4 lines long, its lobes 6 to 8, ovate or ovate-lanceolate, acute, the margin and midrib minutely hispidulous.

European plant, very sparingly naturalized: Wild-cat Creek, *Setchell* and *Jepson*; Berkeley, *Bioletti*; Pilarcitos Lake, San Mateo Co., *Dary*. May.

3. CEPHALANTHUS L. BUTTON BUSH.

Shrub or small tree with opposite or ternate leaves. Flowers densely aggregated into spherical peduncled heads. Calyx-tube inversely pyramidal, the limb 4-toothed. Corolla narrowly funnel-form, slender, the small limb 4-cleft. Style filiform, much exserted. Stigma capitate. Fruit dry and hard, obpyramidal, at length splitting from the base upwards into 2 achene-like portions. (Greek kephale, a head, and anthos, a flower.)

1. *C. occidentalis* L. RIVER BALL-FLOWER TREE. Eight to 12 ft. high or more; trunk often 1 to 1½ ft. in diameter at the base; bark clay-gray, young branches reddish; leaves with short intervening stipules, elliptic to oblong-ovate, slightly attenuate, truncate or obtuse at base, entire, 2½ to 3½ in. long, on petioles 2 lines long; peduncles 1 to 3 in. long; heads ¾ to 1 in. in diameter; calyx greenish; corolla white, 4 lines long, the segments obtuse, tipped with black; fruit nearly 2 lines long; seed 1 line long, flattened, acutely margined.

Common along interior streams, especially the San Joaquin and Sacramento Rivers, sometimes growing 40 ft. in height. Fruiting heads and fruits recalling those of the Sycamore. Aug.-Sept.

96. CAPRIFOLIACEÆ. HONEYSUCKLE FAMILY.

Erect or twining shrubs. Leaves opposite, simple or compound, without stipules or with false foliaceous appendages resembling stipules. Flowers complete. Calyx-tube adnate to the ovary, the toothed limb commonly insignificant. Corolla regular or irregular, 5-merous or rarely 4-merous. Stamens (in ours) as many as the lobes of the tubular or rotate corolla and inserted on its tube or base. Ovary 2 to 5-celled; style elongated or short or hardly any. Fruit in ours a berry or berry-like drupe. Seed-coat adherent to the fleshy endosperm; embryo small.

Leaves pinnately compound; corolla rotate, regular; deciduous shrubs or small trees with compound inflorescence 1. SAMBUCUS.

Leaves simple.

Berry snow-white; corolla open-campanulate or tubular-funnel-form, regular; deciduous shrubs 2. SYMPHORICARPOS.

Berry red or black; corolla tubular, commonly irregular 3. LONICERA.

1. SAMBUCUS L. ELDER.

Shrubs or small trees with odd-pinnate leaves and serrate leaflets.

Flowers small, white, in a terminal compound cyme, jointed with their pedicels. Calyx 5-toothed. Corolla regular, rotate, deeply 5-lobed. Ovary 3 to 5-celled; style short; stigmas 3 to 5; ovules solitary, suspended from the summit of each cell. Fruit small berry-like drupes, with cartilaginous nutlets. (Greek sambuke, a musical instrument, said to have been made of Elder wood.)

Flowers in a flat cyme; berry blue with a bloom; winter buds very small.

Flowers in a thyrsoid panicle; berry scarlet or blue, without bloom; winter buds large, the scales broad, $\frac{1}{4}$ to $\frac{3}{4}$ in. long: var. *callicarpa* of
1. *S. glauca*.
2. *S. racemosa*.

1. ***S. glauca*** Nutt. Bushy or arborescent, 6 to 15 ft. high, the largest specimens tree-like and with a trunk 5 to 9 in. in diameter; bark dark and finely fissured; leaves coriaceous, glabrous; leaflets 5 to 7, lanceolate, ovate or obovate, mostly abruptly acuminate, serrate except at the acuminate apex, 1 to 3 in. long; inflorescence 5-rayed, each ray again 1 to 3 times 5-rayed, forming a flat-topped cyme, 3 to 6 in. broad; flowers white, $3\frac{1}{2}$ lines broad; fruit blue beneath the white bloom.

Common in open woods or cañons of the lower hill country or at middle altitudes, or along stream-banks in the valleys: Coast Ranges; Sacramento and San Joaquin Valleys; Sierra Nevada. Fl. May to Aug. Fr. Aug.-Sept. The berries are used in cookery.

2. ***S. racemosa*** L. var. *callicarpa*. Low, or arborescent and 20 ft. high; leaflets mostly obovate or oblong, commonly acuminate, sharply serrate to the very apex, glabrous above, pubescent with short appressed hairs beneath, 2 to 7 in. long; inflorescence thyrsoid-paniculate, about $2\frac{1}{2}$ in. long, ovate in outline, the axis continued and sending off 7 or 8 lateral primary branches, which are once or twice di- or tri-chotomous; flowers dull white, drying blackish; berries scarlet or black without bloom.—(*S. callicarpa* Greene).

Marin Co. Feb.-Apr. Scales of the winter buds obovate or roundish, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. The shrub bearing black berries has been described by Greene as *S. maritima*,—"Rare or local shrub of the Bay shore at Shell Mound."

2. SYMPHORICARPOS DILL.

Low and branching bushes with small short-petioled simple leaves and scaly leaf-buds. Flowers bibracteolate, white or rosy-tinged, in close short spikes or clusters. Calyx with a globular tube and 4 or 5-toothed limb; limb short, persistent. Corolla regular, open-campanulate or tubular-funnelform, 4 or 5-lobed, the stamens inserted on its throat, in ours included. Ovary 4-celled, each of the 2 lateral cells with a single fertile ovule, the two median cells containing several ovules, none of which develop. Fruit a white berry with bony seeds. (Greek sumphoreo, to bear together, and karpós, fruit, the berries in close clusters.)

Plants 3 or 4 ft. high; leaves mostly 1 in. long, entire or lobed

Plants low, about 1 ft. high; leaves mostly $\frac{1}{2}$ in. long, commonly entire . . .
1. *S. racemosus*.
2. *S. mollis*.

1. **S. racemosus** Michx. SNOW BERRY. Erect or spreading, with slender branches, commonly 3 to 4 ft. high; leaves round-oval to ovate or oblong, entire or on the same branchlet sinuately few-toothed or saliently lobed, glabrous or the lower surface pubescent, commonly 1 (less commonly as much as 2) in. long, short-petioled; calyx-lobes ciliate; corolla pinkish, 2 lines long, 5-lobed above the middle, densely villous-hirsute within; berry globose, 4 to 6 lines in diameter; pulp snowy, nearly tasteless; seeds 2, oblong, flat on one side, low-convex on the other, nearly or quite 2 lines long.

Very common throughout California in the hill country.

2. **S. mollis** Nutt. Low diffuse shrub about 1 ft. high, of somewhat more delicate habit than the preceding and with thinner leaves; leaves oval or elliptic, mostly $\frac{1}{2}$ in. long, seldom other than entire, pubescent on both surfaces or more so on the lower surface; corolla rose-red, barely pubescent within, otherwise like the last.

Coast Ranges, not common (Mt. Diablo, Monterey, San Luis Obispo Co.); Sierra Nevada. Apr.-May.

S. OREOPHILUS Gray. Corolla tubular-funnelform, 5 or 6 lines long.—High Sierras.

3. **LONICERA L.** HONEYSUCKLE.

Erect or twining shrubs with simple entire leaves, one or two pairs beneath the inflorescence often connate-perfoliate. Flowers spicate at the ends of the branches or in small axillary clusters. Calyx-tube ovoid or almost globose, the limb 5-toothed or truncate, deciduous or persistent, mostly small, sometimes none. Corolla with an elongated tube more or less gibbous at base; limb bilabiate with the upper lip 4-lobed or -toothed, or regular and the 5 lobes scarcely unequal. Stamens 5, inserted on the tube of the corolla. Ovary 2 or 3-celled, becoming a few- to several-seeded berry. (Named for Adam Lonitzer, a German herbalist of the 16th century.)

Erect shrub; flowers in pairs on an axillary peduncle; corolla nearly regular

Twining shrub; flower-whorls in terminal spikes. 1. *L. involucrata*.

Flowers pink; leaves, except the lowest, with stipule-like appendages; corolla hispidulous-glandular without: var. *Californica* of

2. *L. hispidula*.

Flowers yellow; leaves mostly without stipule-like appendages; corolla glabrous without 3. *L. interrupta*.

1. **L. involucrata** (Richards) Banks. BLACK TWIN-BERRY. Erect shrub; stems with shreddy bark, 4 to 7 ft. high, or much longer and reclining on other shrubs; leaves opposite (or, on the lower portion of the season's shoot, ternate), oblong, varying to ovate or lanceolate, usually acute or acuminate. $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, on very short petioles; flowers sessile, borne in pairs, side by side on axillary peduncles and subtended by conspicuous bracts; peduncles solitary in the axils, 2 or 3 from each node, about 7 lines long, in fruit twice as long; bracts in 2 sets, 2 outer and 4 inner or these commonly united in pairs; outer bracts round-ovate, cordate at base, $\frac{1}{2}$ in. long; inner $\frac{3}{4}$ in. broad, broader than long; corolla saccate-gibbous on the upper

side at base and with 5 equal or scarcely unequal spreading lobes, 8 lines long, yellow within and without, or somewhat crimson tinged exteriorly, viscid-pubescent; filaments coalescent with the tube about midway; berry 3 to 5 lines in diameter, disagreeable to the taste.

Throughout California. Mar.—May.

2. *L. hispidula* Dougl. var. *Californica* Greene. CALIFORNIA HONEYSUCKLE. Climbing bushes or trees 6 to 20 ft. high, the woody trunk sometimes 1 in. in diameter and the ultimate branches often 3 or 4 ft. long and drooping; leaves ciliate or not ciliate, glabrous above or glaucescent, minutely pubescent and very glaucous beneath, oblong, some ovate, or some upper elliptic-oblong, truncate or subcordate at base, 2 to 3 in. long, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. wide, short-petioled and all except the lowest with conspicuous rounded connate-perfoliate stipule-like appendages; corolla pink, 6 to 7 lines long, glandular-hispidulous without, the tube within and the lower portion of the filaments very hairy; anthers exerted, narrowly linear, 3 lines long; berries red.—(*L. Californica* T. & G.)

Frequent in cañons and along streams of the Coast Ranges: Santa Cruz; Berkeley; Napa Valley. Also Sierra Nevada. Apparently not in the inner Coast Ranges. June. Young plants beneath the shade of pines or other trees show vegetative shoots with the following characters: branchlets hirsute with spreading hairs and with a fine often glandular indument; leaves all distinct and rarely with a stipule-like appendage between the petioles on each side, green above, paler beneath, hirsute with short hairs, oblong-ovate or elliptic, mostly obtuse, truncate or subcordate at base, $\frac{3}{4}$ to $1\frac{1}{2}$ in. long, short-petioled.—Such plants found at Niles, Mill Valley and Howell Mountain are very typical of the species rather than of the variety.

3. *L. interrupta* Benth. CHAPARRAL HONEYSUCKLE. Stems with a rigid woody trunk 1 ft. or so high, the branches climbing or reclining on bushes; leaves orbicular to elliptic-oblong or -ovate, green above, glaucous beneath, $\frac{3}{4}$ to 1 in. long, on petioles $\frac{1}{4}$ in. long, mostly without interfoliar appendages; flowers yellow, in whorls in an interrupted spike; spikes 2 to 5 in. long, peduncled, terminal and solitary or with several additional from the axils of the uppermost leaves, 1 to 3 pairs of which are connate-perfoliate; corolla 4 or 5 lines long, glabrous exteriorly, and nearly so within; filaments hairy towards the base; anthers less than 2 lines long.—(*L. hispidula* var. *interrupta* Gray.)

Dry slopes and ridges of the middle and inner Coast Ranges, climbing 2 to 4 ft. high on bushes of the chaparral: Siskiyou Co.; Vaca Mountains; Howell Mt., and southward to Santa Monica. First collected by Hartweg in a mountain defile leading to the Mission of San Antonio. Also found in the Sierra Nevada. June-July. An ecological form of only subspecific value.

On the lower slopes of Howell Mountain an interesting plant of this species was noticed by the author in Dec., 1897. The branches, which had been borne down to the ground by the falling of other shrubs, were found to have given rise to numerous vertically descending

fleshy rootstocks. These were 1 to 4 in. long, nearly the size of a lead-pencil, very scaly and somewhat 4-sided; scales short and broad, acute, opposite, distinctly connate by a narrow margin, decussate. Examination of other shrubs of the same species fail, thus far, to reveal repetitions of these remarkable structures.

Var. *subspicata* (Gray). MORONEL. Uppermost leaves distinct and often very narrow; inflorescence paniculate.—Corral Hollow, *Brewer*; southward to San Diego.

97. VALERIANACEÆ. VALERIAN FAMILY.

Ours annual herbs with opposite leaves. Flowers mostly perfect, borne in a cymose inflorescence. Corolla epigynous, bilabiate to regularly 5-lobed, the stamens borne on its tube. Calyx-tube adnate to the ovary, its limb obsolete (in ours) or in one species pappus-like. Ovary commonly 3-celled, the two lateral cells reduced to mere nerves, or enlarged and forming wings to the central cell which is 1-seeded and indehiscent.

VALERIANA SYLVATICA Banks. Perennial; stems erect, simple, from rootstocks; radical leaves mainly undivided, obovate; cauline leaves pinnate or pinnately divided, with 3 to 11 or 13 leaflets; calyx-limb of 5 to 15 bristle-shaped calyx-lobes which are coiled up and inconspicuous until the fruiting stage when they unroll and form a conspicuous plumose and pappus-like crown to the fruit.—High Sierras.

1. PLECTRITIS DC.

Annual herbs. Stems simple or rarely with very slender branches. Leaves entire or sparingly toothed, the cauline commonly sessile. Flowers borne in glomerules at the end of the stem or branches, or the glomerules in interrupted or dense spikes. Wings of the fruit commonly incurved and forming a circular hollow or cavity on the side. (From Latin *plecto*, to plait or interweave, on account of the involved inflorescence. Species similar in habit, size, leaves, and inflorescence; our forms little known. The following account is tentative and probably does not include all the species which grow in our region. It is very needful that further and abundant material be collected; this should be accompanied by field notes concerning form and color of corolla and by mature fruit.)

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|--|----------------------------|
| Fruits wingless | 1. <i>P. samolifolia</i> . |
| Fruit conspicuously winged. | |
| Fruit woolly | 2. <i>P. Jepsonii</i> . |
| Fruit not woolly. | |
| Fruit wholly glabrous | 3. <i>P. glabra</i> . |
| Fruit more or less hispid. | |
| Cavity of fruit without subulate appendages. | |
| Wings of fruit meeting above, open below; fruit glabrous externally. | 4. <i>P. magna</i> . |
| Wings of fruit spreading or incurved; fruit more or less hispid externally | 5. <i>P. macrocera</i> . |
| Cavity of fruit with two stout subulate appendages . . | 6. <i>P. Daryana</i> . |

1. *P. samolifolia* (DC.) Hæck. Corolla obscurely bilabiate; spur short; fruit wingless, resembling a buckwheat fruit.

Near the coast northward. Not seen by us.

2. *P. Jepsonii* (Suksdorf) Davy. Simple, about 10 in. high; leaves spatulate-obovate and narrowed to a winged petiole; upper leaves ovate-lanceolate, sessile, acute; fruit conspicuously covered with woolly hairs; incurved margin of wing thickish, marked lengthwise on the outside by a groove.—(*Valerianella samolifolia* Gray.)

Vaca Mountains, May 17, 1892.

3. *P. glabra*. About 1 ft. high, the leaf axils bearing some slender branches; leaves ovate, acute or the lower broadly oblong, all more or less erose or with some few serrulations; spur of corolla broad, almost as broad as the throat; fruit wholly glabrous; margins of the fruit thickish, spreading or equally incurved.

Antioch, *Davy*, no. 951, Apr. 7, 1895.

4. *P. magna* (Greene) Suksdorf. Stems stoutish, often 2 to 2½ ft. high, the remote nodes with 1 or 2 very slender branches; leaves oblong-obovate, obtuse, 1 to 2¼ in. long, the uppermost smaller, ovate and often acute; "corolla white, its spur short and thick;" fruit smooth and somewhat flattened laterally or narrow dorsally, glabrous outside or the margins of the wings ciliate, the cavity with a hispid line; wings with thin margins, not lobed at apex, incurved, meeting above and leaving a small circular opening below, or closed below and open above.—(*Valerianella magna* Greene.)

North Coast Ranges: Vaca Mountains; Napa Mountains; originally collected in Knight's Valley by Greene.

5. *P. macrocera* Torr. & Gray. Slender, mostly simple, 3 or 4 to 8 in. high; leaves linear or narrowly oblong; spur of corolla longer than tube; fruit more or less hispid, dorsally carinate, the carina 2-grooved; lateral wings broad, each with a more or less obvious lobe at apex, spreading or incurved.

Coast Ranges: Napa Mountains and elsewhere.

Var. *ciliosa* (*V. ciliosa* Greene). Carina of fruit ribbon-like, bordered on each side with a rather dense row of short equal bristles perpendicular to it.—Marin Co.

6. *P. Davyana*. Simple, about 1 ft. high; leaves mostly narrowly oblong; flowers in a dense and mostly uninterrupted spike; spur of corolla much shorter than throat; fruit with broadish back, more or less hispid, the carina bordered with many hispid hairs; wings not lobed at apex, incurved, and merging gradually into the beak; cavity of fruit with a small depression on each side from which arises a single stout subulate body.

Antioch, *Davy*, no. 953, Apr. 7, 1895.

98. DIPSACEÆ. TEASEL FAMILY.

Herbs with opposite leaves. Flowers in dense heads or short spikes surrounded by an involucre. Calyx-tube adnate to the ovary, its

limb cup-shaped or divided into bristles. Corolla borne on the calyx-limb, with 4 or 5-lobed limb. Stamens 2 to 4, inserted on the throat of the corolla. Ovary 1-celled; style filiform; ovule 1. Fruit an achene, crowned with the persistent calyx.

Bracts of the spike or head conspicuous, rigid, prickly-pointed, exceeding the flowers.

Bracts of the head herbaceous, inconspicuous, concealed among the flowers.

1. *DIPSACUS*.2. *SCABIOSA*.

1. *DIPSACUS* L.

Stout coarse and prickly biennial herbs. Cauline leaves united at base. Flowers pinkish white, in a dense oblong head or short spike, surrounded by an involucre of elongated bracts much surpassing the pointed bracts subtending the flowers. Bracts in fruit very rigid and spine-like. Calyx-limb cup-shaped, 4-toothed. Corolla 4-lobed. Stamens 4. Achene surrounded by a 4 to 8-ribbed involucre. (Greek name of the Teasel.)

1. *D. fullonum* L. FULLER'S TEASEL. Four or 5 ft. high; radical leaves broadly oblong, arcuate, $1\frac{1}{2}$ in. long or less; upper cauline connate-perfoliate; spikes 3 or 4 in. long; bracts of the involucre narrowly linear, tapering to the acute apex, 1 to 4 in. long; bracts of the spike with recurved tips; stamens 2 to 4, exserted.

Abundant in low and waste lands about San Francisco Bay: Berkeley; Alameda; San Jose; Marin Co. *D. sylvestris* Huds., Common Teasel, has been found wild at the Presidio, San Francisco; the bracts of its spikes have straight tips.

2. *SCABIOSA* L.

Large herbs with opposite leaves and the flowers in hemispherical heads on long peduncles. Involucre of many distinct bracts. Involucre cylindrical, not lobed. Calyx-tube adnate to the ovary, produced slightly beyond it and bearing 5 long slender awns. Corolla inserted on the summit of the calyx-tube, slender-funneliform or salverform, with 5 short equal lobes, the marginal ones very much larger with the upper lobes much smaller than the lower. (Latin *scabiosa*, meaning scurfy, the plant used for affections of the skin.)

1. *S. atropurpurea* L. MOURNING BRIDE. Stems branching, 2 or 3 ft. high; lowest leaves lyrate; upper leaves pinnately divided or the uppermost oblong-lanceolate and coarsely serrate or the narrower ones disposed to be entire; peduncles 8 to $1\frac{1}{2}$ in. long; heads $1\frac{1}{2}$ in. broad; flower black-purple to pinkish white, the regular corollas 5 or 6 lines long; calyx-awns 3 lines long; fruit an achene, enclosed in the persistent involucre and bearing the exserted calyx-awns.

An escape from the gardens, naturalized by waysides: Berkeley; Solano Co., etc. Called "Pin Cushion" by children at East Oakland.

99. CAMPANULACEÆ. BELL-FLOWER FAMILY.

Herbs with milky juice and alternate simple leaves. Flowers regu-

lar and complete, 5-merous except in the pistil. Tube of the calyx adnate to the ovary, its limb persistent, usually divided down to the ovary. Corolla and stamens epigynous or semi-epigynous (inserted where the calyx becomes free), or the stamens on the base of the corolla. Style single, long, with 2 to 5 stigmas. Ovary 2 to 5-celled. Fruit a many-seeded capsule.

Capsule dehiscent on the side by small valves or circular perforations.

Flowers usually alike; corolla more or less campanulate. 1. CAMPANULA.

Flowers of two kinds; corolla rotate. 2. SPECULARIA.

Capsule irregularly indehiscent; flowers of 2 kinds on the one plant. 3. HETEROCODON.

Capsule dehiscent at the apex within the calyx; calyx clavate and strongly 10-ribbed; corolla tubular-campanulate. 4. GITHOPSIS.

1. CAMPANULA L. BELL-FLOWER.

Annual or perennial herbs. Calyx with 5 narrow lobes, its tube short and broad. Corolla campanulate or nearly so, with 5 lobes. Filaments dilated at base. Stigmas and cells of the ovary 3 to 5. Capsule mostly short, opening laterally by 3 to 5 small valve-like perforations. (Diminutive of Latin campana, a bell.)

Perennials; style filiform, long-exserted; capsule hemispherical or short-turbinate, the openings near the middle or base.

Style exceeding the corolla. 1. *C. linnæifolia*.

Style shorter than the corolla.

Leaves sessile; corolla-lobes narrowly lanceolate. 2. *C. prenanthoides*.

Leaves petioled; corolla-lobes ovate-oblong. 3. *C. Scouleri*.

Annuals; style included in the corolla; capsule urn-shaped, the opening just above the middle; flowers dimorphic. 4. *C. exigua*.

1. *C. linnæifolia* Gray. About 1 ft. high, slender, simple or sparingly branched at summit; leaves ovate-oblong, crenulate except at base, sessile or subsessile, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the margins retrorsely scabrous, as also the angles of the stem; peduncles one or several towards the summit; corolla pale blue, campanulate, 5-cleft, $\frac{1}{2}$ in. long; calyx-lobes lanceolate.

Point Reyes, *Davy*, northward to Mendocino Co. June-July.

2. *C. prenanthoides* Durand. CALIFORNIA HARE-BELL. Perennial, slender, erect, $1\frac{1}{2}$ to 2 ft. high, often much branched; herbage minutely rough-puberulent or almost glabrous; leaves oblong-ovate or lanceolate, sessile, 1 in. long or less, sharply serrate; flowers mostly in clusters on short pedicels; clusters axillary, or the upper leaves reduced and the inflorescence racemose; corolla cylindrical in the bud, 4 or 5 lines long, 2 or 3 times the length of the subulate calyx-lobes, parted into linear-lanceolate lobes; capsule hemispherical or short-turbinate, the openings near the middle or base.

Wooded hills, near the coast from Monterey northward; Sierra Nevada from Placer Co. to Mt. Shasta. July.

3. *C. Scouleri* Hook. Glabrous perennial; stem slender, erect, or decumbent at base, mostly simple, 6 to 12 in. high; leaves ovate to lanceolate, sharply serrate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, tapering at base into a margined petiole; flowers on filiform peduncles, solitary in the axils or terminal, or the upper leaves reduced to minute bracts and the

inflorescence paniculate; corolla exceeding or twice as long as the subulate calyx-lobes, deeply 5-cleft into ovate-oblong lobes.

Redwood region from Marin Co. northward.

4. **C. exigua** Rattan. Branching from the base and diffuse, 2 to 4 or 6 in. high, short-hispid, especially at base; leaves obovate, linear, or the uppermost subulate; flowers erect, lateral or terminal on the branchlets, two kinds on the same plant:—one with slender and rather short style having 3 revolute stigmas at apex and with the dilated bases of the filaments not ciliate; the other kind with the style longer, conspicuously club-shaped and merely notched at apex, the dilated bases of the filaments ciliate; corolla of both kinds light blue, 2 to 4 lines long; calyx-lobes subulate-linear, nearly twice the length of the turbinate tube; capsule somewhat urn-shaped, with 3 valvular openings just above the middle.—(*C. angustiflora* Eastwood.)

Summits of peaks or on the higher ridges of the Coast Ranges: Mt. Hamilton; Mt. Diablo (where first collected by Rattan); Mt. Tamalpais; Mt. St. Helena. The above description chiefly from Mt. Diablo plants collected by Greene, whence in particular the characterization of the two kinds of styles and stamens which answer to the description and figures of Miss Eastwood's *C. angustiflora* and *C. exigua* respectively. (Cf. Proc. Cal. Acad. Sci. 3d Ser. Bot. i. 132, Pl. xi.) Our material is scanty but in all probability individual plants will be found possessing only one sort of flowers and this may commonly be the case. The corollas are also of two kinds, oblong-campanulate and tubular. The oblong-campanulate corolla is associated with both sorts of styles in our Mt. Diablo material; Miss Eastwood's figure shows a tubular corolla associated with the slender-styled form (*C. angustiflora*). This note, it is hoped, will inspire field-studies of this species along the lines suggested.

2. **SPECULARIA** Heister. VENUS LOOKING-GLASS.

Annuals with leafy slender stems. Flowers in the axils of the leaves, blue or purplish, 1 or 2-bracteolate. Our species with two kinds of flowers: the earlier fertilized in the bud, with undeveloped corolla and 3 or 4 calyx-lobes; the latter with ordinary flowers and 5-lobed calyx. Corolla rotate or nearly so, 5-lobed or -parted. Stigmas and cells of the ovary 3, sometimes 2 or 4. Capsule prismatic or cylindraceous, dehiscent by small valvular openings on the sides at the middle or near the summit. (Latin speculum, a looking-glass.)

1. **S. biflora** (R. & P.) Gray. Stems erect, simple or with many branches from the base, 8 to 15 in. high, retrorsely scabrous-hispidulous on the angles; leaves ovate, mucronate, sessile, entire, or somewhat crenate, 3 to 6 (or the lowermost 8 or 9) lines long; flowers solitary or in pairs in the axils; corolla blue, exceeding the linear-lanceolate calyx-lobes; capsule 4 lines long, sessile.—(*Legouzia biflora* Britton.)

Low open hills of the inner Coast Ranges, grain fields of the

Sacramento and San Joaquin Valleys, and southwestward to Pajaro (H. P. Chandler). Apr.-May.

3. *HETEROCODON* Nutt.

Annuals. Like *Specularia* in habit and the flowers of two kinds, the earlier with 3 or 4, the later with 5 calyx-lobes which are large and leaf-like and much longer than the obpyramidal tube. Corolla open-campanulate, 5-lobed. Capsule 3-celled, 3-angled, bursting by mostly irregular longitudinal fissures in the thin spaces between the angles or ribs. (Greek heteros, different, and kodon, bell, the flowers campanulate and of two different kinds.)

1. *H. rariflorum* Nutt. Very slender, with filiform stems $1\frac{1}{2}$ to 9 in. high; leaves roundish, $1\frac{1}{2}$ to 5 lines long, sessile, truncate or subcordate at base, sharply toothed, the teeth bristle-pointed and the margin between the teeth frequently ciliate-bristly; flower solitary; calyx sparsely hispid, its lobes 3 to 5, mostly 3 or 4, when 4 or 5 one or two smaller; flowers solitary; calyx-lobes ovate, foliaceous and sparingly toothed, 1 to 3 lines long; corolla scarcely evident, or the later flowers with well developed light blue corolla (the short lobes darker), the tube $1\frac{1}{2}$ to 2 lines long; style apparently short-puberulent.

Coast Ranges (Berkeley, Napa Valley, Lake Co. and northward); Sierra Nevada; Southern California. Apr., or as late as July in the higher mountains.

4. *GITHOPSIS* Nutt.

Annual herbs. Calyx-tube cuneate, strongly 10-ribbed, adnate up to the summit of the ovary, with 5 linear foliaceous lobes. Corolla tubular-campanulate, 5-lobed. Filaments short, dilated at the base; anthers long and linear. Ovary 3-celled; stigma 3-lobed. Capsule coriaceous, crowned with the rigid calyx-lobes of its own length, strongly striate-ribbed, many-seeded, dehiscing by a perforation at the apex in the place where the persistent style falls away. (Name from Githago, the calyx resembling that of the Corn-Cockle.)

1. *G. specularioides* Nutt. Stems simple or with 1 or 2 proliferous branches, these in turn sometimes proliferous, 4 to 7 in. high; herbage retrorsely rough-pubescent or glabrous; upper leaves oblong, or narrower, 3 to 5 lines long, the lowermost obovate, 1 or 2 lines long, all sharply few-toothed; calyx-lobes 3 to 8 lines long, eventually callous-ribbed, shorter than or 3 or 4 times as long as the corolla; corolla purplish, its lobes shorter than the tube; capsule rigid, tapering into a short and stout peduncle.

Open ground in the hill country of the Coast Ranges (Round Valley, Napa Valley, Sonoma); Sierra Nevada. The var. *DIFFUSA* (*G. diffusa* Gray) is nearly glabrous; sinuses of the calyx hispidulous. —Vaca Mountains; Southern California.

100. LOBELIACEÆ. LOBELIA FAMILY.

Herbs with alternate leaves. Flowers in racemes, complete. Calyx-tube adnate to the ovary, its free border with 5 distinct lobes or

teeth. Corolla epigynous, bilabiate, 2 lobes in the upper lip and 3 in the lower. Stamens 5, inserted with the corolla, but generally free from it and alternate with its lobes; anthers and filaments usually united into a tube about the style. Ovary 2-celled; style 1; stigma capitate and girt with a rim of hairs. Juice mostly milky and acrid. Fruit in ours a many-seeded 1 or 2-celled capsule.

Stems erect or ascending; corolla conspicuously bilabiate; capsule commonly 1 to 2 in. long. 1. *BOLELIA*.
Stems procumbent; corolla-segments only slightly unequal; capsule $\frac{1}{2}$ in. long. 2. *HOWELLIA*.

1. *BOLELIA* Raf.

Dwarf herbs of low plains, margins of vernal pools, sometimes in the mountains or in saline marshes. Calyx-tube (adnate to the ovary) very long and stalk-like. Corolla with a short tube and ample bilabiate limb; lips spreading, the larger 3-lobed, the smaller 2-cleft with narrow divisions. Anther-tube incurved, one or two of the anthers tipped with a bristle-like point. Ovary 2-celled, becoming a 1-celled capsule with 2 parietal filiform placentæ. Capsule long and linear, crowned with the persistent calyx-lobes, dehiscent below the apex by 1 to 3 long fissures. (Anagram of *Lobelia*.)

The chief character used in the discrimination of species in this genus is that of color, but it is to be said that extended field investigations on the part of the author show this character to be exceedingly variable. It is, therefore, doubtful if most of the species here listed are more than color forms. *B. elegans* is, however, by the structure of its corolla, quite distinct from all the other species, which form a separate group of which *B. pulchella* is taken as the natural type. Typical *B. pulchella* as here closely circumscribed, has a very bright and characteristic corolla, which when once seen is readily recognized a second time. This species has two diverging lines of variation, one reaching towards *B. concolor* with disappearance of yellow in the corolla; the other extending to *B. ornatissima* through *B. bicornuta* (not within our limits) and ending in *B. humilis*.

Anther-tube much incurved, nearly hook-shaped 1. *B. elegans*.

Anther-tube straight or only slightly curved.

Corolla conspicuously bilabiate.

Lower lip with a central maroon spot 2. *B. concolor*.

Lower lip with a central yellow spot.

Tube shorter than calyx-lobes 3. *B. pulchella*.

Tube much longer than calyx-lobes 4. *B. cuspidata*.

Corolla small and pale 5. *B. ornatissima*.

Corolla obscurely bilabiate, the lobes similar 6. *B. humilis*.

1. *B. elegans* (Lindl.) Greene. Commonly simple, 4 to 7 in. high; leaves oblong to oblong-lanceolate, $\frac{1}{2}$ in. long; corolla-tube campanulate; the upper lip cut $\frac{2}{3}$ the way down, the segments ascending and parallel; lower lip 3-lobed at apex, the lobes and lateral parts of the body sky-blue marked with darker veinlets, main portion white and bearing 2 oblong parallel green or greenish yellow spots; side of throat next to lower lip frequently with purple spots and yellow lines; stamen-column long-exserted, about equaling the upper segments.—(*Downingia elegans* Torr. *B. insignis* Greene.)

Beds of vernal pools (where water has recently stood), on the plains of the Sacramento Valley. May. Lower lip somewhat concave.

2. **B. concolor** Greene. Branched from the base and somewhat tufted or nearly simple, 4 to 5 in. high, minutely puberulent; corolla light blue; base of lower lip or all of it below the lobes or divided part with a well-defined spot or area of dark maroon; upper lip cleft to the middle only; lobes of lower lip slightly unequal; stamen-column little exerted.

Low fields near Suisun. May-June.

Var. **tricolor** (B. tricolor Greene). Lower lip with the transverse somewhat quadrate spot of dark maroon bordered by white, this color sometimes extending to the bases of the violet lobes; throat often with yellow folds. Varying into the next.

3. **B. pulchella** (Lindl.) Greene. Erect or ascending, 2 to 10 in. high, usually simple; leaves oblong-ovate or narrower, $\frac{1}{2}$ in. long; lower lip of corolla cleft into 3 roundish apiculate lobes; upper lip deeply 2-cleft, the oblong-lanceolate lobes divergent and spreading; corolla deep blue, the center of the lower lip yellow with a white border, this somewhat irregular in outline but sharply defined against the violet; side of throat next to the lower lip with three dark violet spots either side of and in the interval between a pair of narrow yellow folds or lines which join the yellow field; corolla-tube 1 line long, the limb ample, 6 lines broad and 4 lines deep, the lower lip plane and at a right angle to the tube; stamen-column nearly or quite equaling the lobes of the upper lip.—(*Downingia pulchella* Torr.)

The most common and most beautiful species: plains of the Lower Sacramento in Solano Co.; abundant and of rank growth in salt marshes near Alvarado; low places in fields between Gilroy and San Felipe. May-June.

4. **B. cuspidata** Greene. Stems very slender and leaves scarcely exceeding 1 line; flowers few; lower lip of the corolla broadly trefoil-shaped, broader than long; lobes broadly ovate, retuse or somewhat obcordate, cuspidately pointed, the terminal half violet, the lower portion white; undivided part of lower lip yellow, plane or nearly so, that is, without protuberances or folds; lobes of the upper lip $1\frac{1}{2}$ lines long; spatulate-obovate, cuspidately acute, slightly divergent, deep violet; anther-tube scarcely exerted from the comparatively long ($1\frac{1}{2}$ lines) and narrow corolla-tube.

North Coast Ranges: Los Guilicos and Napa Valleys. May-June.

5. **B. ornatissima** Greene. Erect, slender, 2 to 6 in. high, simple or branched from the base; tube of corolla raised into a protuberance at base of upper lip, the segments of which are coiled backward into a ring; basal portion of lower lip with 4 short folds, the center white with greenish yellow spots, the lobes blue, all the colors very pale; stamen-column exerted beyond the tube.

Plains of the Lower Sacramento between Elmira and Cannon.

May. This is, doubtless, a reduced form of *B. bicornuta* (Gray) while the next is a still further reduction.

6. *B. humilis* Greene. Very dwarf, 1 in. high; calyx-segments unequal; corolla minute, white, 1 line long, obscurely bilabiate, the ovate-oblong acute segments not very unlike.

Sonoma Co.

2. *HOWELLIA* Gray.

Either aquatic or of muddy margins of pools. Flowers more or less cleistogamous. Calyx-tube united for its whole length to the ovary, the limb with slender segments. Corolla not surpassing the calyx, its very short tube divided nearly to the base on the (apparently) upper side; lobes oblong, nearly equal, three united higher. Ovary 1-celled, the filiform parietal placentæ each with 3 to 5 ovules. Capsule membranaceous, bursting irregularly on one side. (In honor of Thos. Howell of Portland, now author of a pioneer flora of Oregon, Washington and Idaho.)

1. *H. limosa* Greene. Weak and procumbent, the branches 1 ft. long, sometimes matted; leaves lanceolate, sessile, entire, 1 in. long; flowers cleistogamous; capsule clavate-oblong, $\frac{1}{2}$ in. long, crowned by the 5 triangular calyx-teeth.

Muddy shores: Suisun. **May.** This may be simply a terrestrial form of *H. aquatilis* Gray.

101. COMPOSITÆ. SUNFLOWER FAMILY.

Annual or perennial herbs or shrubs with alternate or opposite leaves. Flowers in heads, borne on the enlarged summit of the peduncle (receptacle) and surrounded by the bracts of the involucre. Receptacle with bracts subtending the flowers, or with bristles among the flowers, or without bracts or bristles (naked). Corollas tubular and 5-toothed or -lobed, or the limb strap-shaped (or ligulate) and toothed at apex, those of a head all tubular or all ligulate or of both kinds. When both kinds are present the flowers with the ligulate corollas occupy the margin of the head and are called ray-flowers, and the ligulate corollas, rays; the flowers with the tubular corollas occupy the center and are called disk-flowers. Ray-flowers commonly pistillate, sometimes perfect or neutral; disk-flowers commonly perfect, often staminate or pistillate. Heads with both ray- and disk-flowers are called radiate; with disk-flowers only, discoid. Calyx-tube united with the ovary, the limb when present called a pappus and greatly varied in structure, consisting of awns, hairs, bristles, scales or paleæ, or in many cases appearing as a mere crown or ring or wholly obsolete. Stamens 5; filaments free; anthers united and forming a tube, or nearly or quite free in *Ambrosiæ*. Style divided above into 2 long branches which bear stigmatic lines on the inside. Ovary 1-celled, 1-ovuled, maturing into an achene, crowned by the pappus when that is present. Pappus commonly persistent and assisting in the dispersion of the 1-seeded fruit.

KEY TO THE TRIBES.

Heads composed wholly of perfect flowers with ligulate corollas; ligule 5-toothed at apex; herbs with milky juice; leaves alternate or radical.

1. CICHORIEÆ.

Heads composed of ray- and of disk-flowers or of disk-flowers only.

Receptacle covered with bristles; heads large; flowers conspicuous; corollas cleft into long narrow lobes; rays none; very spiny thistles or thistle-like plants; leaves alternate

2. CYNAREÆ.

Receptacle with chaffy bracts (see also nos. 28 and 29).

Rays always present, conspicuous or inconspicuous; disk-flowers perfect; bracts of the involucre foliaceous or herbaceous, not scarious; pappus of paleæ or awns, never capillary.

Involucre of 1 series of equal bracts, each embracing or enfolding a ray-achene; bracts of receptacle often in a single series between ray and disk; leaves alternate or opposite; (annuals except two).

6. MADIEÆ.

Involucre of 1 to several series of bracts, none enfolding ray-achenes; receptacle very chaffy; leaves mostly opposite or radical

7. HELIANTHEÆ.

Rays none; leaves alternate (except no. 69).

Heads unisexual (except no. 63), small, greenish or white; corolla of pistillate flowers none or a rudiment; anthers nearly or quite distinct; pappus none; fruit usually a bur; leaves alternate (the lower opposite in no. 63)

8. AMBROSIEÆ.

Heads composed of both pistillate and staminate (or perfect) flowers; corolla of pistillate flowers filiform; bracts of the involucre few or none; leaves alternate (except no. 69); white-woolly annuals.

9. INULEÆ.

Receptacle naked (without bristles or chaffy bracts, except nos. 28 and 29); leaves alternate (except nos. 26, 36, 37, 38, and 91).

Bracts of involucre in 1 or 2 series; pappus of soft capillary bristles; both disk- and ray-flowers yellow (except no. 23).

3. SENECEONEÆ.

Bracts of involucre imbricated, dry and scarious; pappus none or reduced to a mere crown or ring; flowers white, yellow or greenish; rays present or absent; leaves usually much divided.

4. ANTHEMIDEÆ.

Bracts of involucre in few series, little imbricated; pappus paleaceous, awn-like, bristly or none; flowers yellow; rays present (except in no. 42)

5. HELENIEÆ.

Bracts of the involucre many and imbricated, often dry or scarious; pappus of capillary bristles; rays none; pistillate corollas mostly filiform; (pappus none and bracts few in no. 75)

9. INULEÆ.

Bracts of involucre well imbricated; disk-flowers commonly yellow, the rays of the same or different color or none; pappus of awns or bristles (or of short scales in no. 76)

10. ASTEREÆ.

Bracts of the involucre equal or imbricated; flowers perfect, white or whitish; rays none

11. EUPATORIEÆ.

TRIBE 1. Cichorieæ. CHICORY TRIBE.

Herbs with milky juice and alternate or radical leaves. Receptacle naked or with chaff-like bracts. Flowers all perfect and all with ligulate corolla, the ligule 5-toothed at apex. Anthers sagittate or auricled at base, commonly appendaged at summit. Style-branches stigmatic on their inner side for their whole length.

A. Pappus paleaceous or of rigid bristles.

Pappus paleaceous, the paleæ without awns; achenes neither ribbed nor beaked.

Flowers blue; receptacle naked; herbage soft . . . 1. CICHORIUM, p. 490.

Flowers yellow; receptacle with chaff-like bracts; thistle-like plant . . . 2. SCOLYMUS, p. 490.

Pappus-bristles (or some of them) plumose.

Receptacle naked.

Achenes not beaked nor ribbed; tall annuals, paniculately branching above 3. *PTILORIA*, p. 491.

Achenes (at least the inner) with a slender beak.

Flowers yellow; achenes 5 to 10-ribbed; low branching thistle-like biennial 4. *PICRIS*, p. 491.

Flowers purple; achenes ribbed; perennial or biennial with grass-like leaves 5. *TRAGOPOGON*, p. 492.

Flowers white; achenes obscurely ribbed; stem branching above; annual 6. *RAFINESQUIA*, p. 492.

Receptacle with chaff-like bracts; at least the inner achenes beaked; flowers yellow; stems naked; leaves radical 7. *HYPOCHÆRIS*, p. 493.

Pappus paleaceous, the paleaceous portion short or often very long, tipped with a long or short bristle or awn which is either naked or barbellate, or rarely subplumose.

Ligules short, the head in anthesis small; bracts of the involucre equal but with shorter ones at base, all membranous; pappus-bristles 5.

Paleæ of the pappus elongated, cleft at tip, the short bristle or awn proceeding from the cleft; peduncle enlarged at summit; heads erect. 8. *UROPAPPUS*, p. 493.

Paleæ of the pappus mostly short, abruptly or gradually passing into the awn; peduncles not enlarged at summit; heads nodding in the bud. 9. *MICROSERIS*, p. 494.

Ligules elongated, the heads in anthesis showy; bracts of the involucre imbricated in several series; pappus-bristles 10 or more, barbellate or subplumose, the paleaceous base short and firm 10. *SCORZONELLA*, p. 496.

B. Pappus of fine soft capillary bristles, scabrous but never plumose; achenes ribbed or nerved.

Achenes not flattened; receptacle naked, or bristly in some species of no. 11.

Achenes beakless; stems commonly branching or the plants acaulescent.

Pappus mostly soft and deciduous; achenes terete, truncate 11. *MALACOTHRIX*, p. 497.

Pappus dull white or tawny; achenes linear 12. *HIERACIUM*, p. 498.

Pappus white; achenes columnar or fusiform 13. *CREPIS*, p. 499.

Achenes with a slender beak; acaulescent plants, the peduncles 1-flowered 14. *AGOSERIS*, p. 499.

Achenes flattened; receptacle naked; leafy-stemmed plants.

Achenes beaked; heads in a panicle 15. *LACTUCA*, p. 501.

Achenes not beaked; heads corymboid or umbellate 16. *SONCHUS*, p. 501.

TRIBE 2. *Cynareæ*. THISTLE TRIBE.

Thistles or thistle-like herbs with alternate prickly leaves. Heads large. Bracts of the involucre imbricated, usually prolonged into a spine or bristle, or provided with a membranous edge. Receptacle bristly or hairy. Flowers all perfect. Rays none. Corollas tubular, cleft into long narrow lobes. Anthers long-tailed at the base, with elongated appendages at the tip. Pappus bristly or plumose, rarely paleaceous.

A. Achenes obliquely or somewhat laterally inserted on the receptacle.

Heads not leafy-involucrate; pappus-bristles or -scales in 2 or 3 rows or none 17. *CENTAUREA*, p. 502.

Heads leafy-involucrate; pappus-awns in 2 series 18. *CNICUS*, p. 503.

B. Achenes inserted on the receptacle by their very base.

Filaments distinct.

Pappus paleaceous and double (in 2 different sets). 19. *CARTHAMUS*, p. 503.

Pappus of plumose bristles, united at base and deciduous in a ring.

- Bristles of the pappus in several series; achenes somewhat 4-angled 20. CYNARA, p. 504.
 Bristles of the pappus in a single series; achenes not angled 21. CIRSIUM, p. 504.
 Filaments united below; pappus of narrow barbellate paleae 22. SILYBUM, p. 509.

TRIBE 3. Senecioneæ. GROUNDSEL TRIBE.

Herbs, or two species suffrutescent. Leaves alternate or radical. Bracts of the involucre little or not at all imbricated, mostly in 1 or 2 rows. Receptacle naked. Flowers of both disk and ray yellow, except Petasites. Anthers not caudate. Pappus-bristles soft, commonly copious, most often white.

A. Radical leaves broad, palmately cleft or parted.

- Cauline leaves scale-like; flowers subdioecious, whitish; pistillate corollas distinctly ligulate 23. PETASITES, p. 509.
 Cauline leaves similar to the radical; flowers all perfect and fertile, yellow; rays none 24. CACALIOPSIS, p. 510.

B. Leaves not palmately parted; flowers yellow.

- Bracts of the involucre linear, rigid; heads rayless; leaves entire, sessile, white-woolly beneath 25. LUINA, p. 510.
 Bracts of the involucre thin-herbaceous; heads radiate or rayless; leaves various.
 Leaves chiefly opposite; heads large 26. ARNICA, p. 511.
 Leaves alternate; heads large or small 27. SENECIO, p. 511.

TRIBE 4. Anthemideæ. MAYWEED TRIBE.

Strong-scented or aromatic plants. Leaves alternate, all or some of them finely dissected, pinnately parted or pinnatifid, except one species. Bracts of the involucre imbricated, commonly dry and scarious or with scarious margins. Receptacle naked or with chaff-like bracts. Flowers white, yellow or greenish. Rays present or none. Anthers not caudate. Pappus none or a short scarious crown.

A. Receptacle with chaff-like bracts.

- Heads solitary, terminating leafy branches or peduncles; rays 14 to 20; annual 28. ANTHEMIS, p. 514.
 Heads in a terminal corymb; rays 4 or 5; perennial 29. ACHILLEA, p. 514.

B. Receptacle naked.

All of the flowers with a corolla.

- Heads solitary, terminating leafy branches or peduncles.
 Rays many, conspicuous 30. CHRYSANTHEMUM, p. 515.
 Rays none; flowers all alike, perfect, greenish; annual 31. MATRICARIA, p. 515.
 Heads corymbose; rays none; flowers yellow; perennial 32. TANACETUM, p. 515.
 Heads in paniced racemes or spikes, small; rays none; flowers yellow or purplish; shrubs or herbs 33. ARTEMISIA, p. 516.
 Marginal flowers without a corolla; heads discoid.
 Heads peduncled; mature achenes borne on pedicels; style deciduous 34. COTULA, p. 517.
 Heads sessile; achenes pointed with the spine-like persistent style 35. SOLIVA, p. 518.

TRIBE 5. *Heleniæ*. SNEEZEWEED TRIBE.

Herbs or some Eriophyllums suffruticose. Leaves alternate or opposite. Flowers in all our species yellow. Rays present in all our species except *Chænactis*. Anthers not caudate. Receptacle naked. Bracts of the involucre in 1 or 2, sometimes in 3 or 4(?) series. Pappus of paleæ, awns or bristles, or often wanting.

A. Leaves opposite; herbage glabrous, pubescent or slightly tomentose, never white-woolly.

Bracts of the involucre imbricated, in more than 1 series; pappus none; succulent perennial. 36. *JAUMEA*, p. 518.

Bracts of the involucre in a single series and
United into a toothed cup; pappus paleaceous or none; annuals. 37. *LASTHENIA*, p. 519.

Distinct; pappus of paleæ or bristles, or both, or none; annuals except one. 38. *BÆRIA*, p. 519.

B. Leaves alternate; herbage glabrous or in several genera white-woolly.

Ray-corollas with a toothed appendage at base opposite the ligule; pappus none; leaves entire or denticulate; annuals. 39. *MONOLOPIA*, p. 522.

Ray-corollas without appendage at base.

Pappus present.

Bracts of the involucre erect.

Rays conspicuous; paleæ firm, blunt; leaves divided or incised; perennial herbs or suffruticose plants. 40. *ERIOPHYLLUM*, p. 522.

Rays very inconspicuous; paleæ subulate; leaves narrowly linear and entire; slender annual. 41. *RIGIOPAPPUS*, p. 524.

Rays none or the marginal corollas palmately enlarged; leaves divided; annuals. 42. *CHÆNACTIS*, p. 524.

Bracts of the involucre reflexed; rays usually drooping; paleæ short-pointed; leaves often decurrent; perennial herbs. 43. *HELENIUM*, p. 525.

Pappus none; leaves pinnately parted; low annual. 44. *BLENNOSPERMA*, p. 526.

TRIBE 6. *Madieæ*. TARWEED TRIBE.

Ours annuals (except one species of no. 45 and no. 54). Herbage glandular, viscid or heavy-scented (except nos. 53, 54, and 55). Leaves alternate or opposite. Bracts of the involucre in a single series, each partly or completely enclosing an achene. Bracts of the receptacle commonly in a single series between disk- and ray-flowers and often united into a cup, or sometimes scattered among the disk-flowers. Rays always present, showy or inconspicuous. Anthers not caudate. Ray-achenes always fertile, without pappus (except nos. 51 and 54); disk-achenes fertile or sterile, their pappus paleaceous, awn-like or none.

A. Ray-achenes laterally compressed, completely enfolded by the deeply sulcate bracts of the involucre which are strongly carinate on the back.

Rays showy or inconspicuous; disk-flowers few to many; mostly tall plants. 45. *MADIA*, p. 527.

Rays inconspicuous; disk-flowers one; low slender plants. 46. *HARPÆCARPUS*, p. 528.

B. Ray-achenes turgid or somewhat obcompressed, half enclosed by the bracts of the involucre which are rounded on the back.

Achenes of ray without pappus.

Rays 5 to 40, 2 or 3-lobed or -toothed; disk-achenes with or without pappus; leaves, at least at base, not entire.

Leaves not spiny, commonly viscid and glandular.

Receptacle flat; rays 5 to 25, always (?) 3-lobed; bracts of involucre and of receptacle at length deciduous. . . . 47. HEMIZONIA, p. 529.

Receptacle convex; rays about 15, 3-lobed; bracts of involucre and of receptacle persistent, the outer beset with clavate processes. . . . 48. HOLOCARPHA, p. 531.

Leaves (at least the upper) spinose and rigid, little viscid or glandular; rays 25 to 40, 2-lobed; bracts of involucre and of receptacle persistent or deciduous, not beset with processes. . . 49. CENTROMADIA, p. 532.

Rays 1 to 5 (or 8), broad and palmately 3-lobed; achenes with paleaceous pappus; leaves all narrowly linear and entire. . . . 50. CALYCADENIA, p. 533.

Achenes of ray with pappus; disk-achenes with plumose pappus. . . . 51. BLEPHARIZONIA, p. 534.

C. Ray-achenes obcompressed or clavate, completely enfolded by the bracts of the involucre, which at base have thin margins and flattish backs.

Achenes in fruit not expanding; pappus present or none.

Vernal annuals; rays 8 to 20, commonly showy, yellow, white, or yellow tipped with white. . . . 52. BLEPHARIPAPPUS, p. 535.

Summer plants; rays 5, comparatively inconspicuous.

Annuals; heads clustered; bracts of receptacle distinct; rays pale yellow; pappus none. . . . 53. LAGOPHYLLA, p. 538.

Perennial; heads solitary; bracts of receptacle connate; flowers white or rose-tinted; pappus present. . . . 54. HOLOZONIA, p. 539.

Achenes in fruit expanding into an open globose head; pappus silvery-scarious, the longer set of paleæ longer than the achenes. . . . 55. ACHYRACHÆNA, p. 539.

TRIBE 7. Heliantheæ. SUNFLOWER TRIBE.

Herbs with mostly opposite or radical leaves. Herbage commonly with balsamic-resinous juice. Rays present, almost always showy. Bracts of the involucre herbaceous or foliaceous, or at least not scarious. Receptacle with chaff-like bracts, each subtending a flower. Anthers not caudate. Pappus paleaceous, of rigid awns, or cup-like, never of capillary bristles. Achenes thick or flattened contrary to the subtending chaffy bract, never parallel with it.

A. Bracts of the involucre in 2 to several series.

Involucre of 2 series of similar bracts; flowers white; leaves opposite. . . . 56. ECLIPTA, p. 540.

Involucre imbricated, its bracts in several series; flowers yellow.

Ray-flowers maturing achenes; low perennials with broad radical leaves.

Pappus none. . . . 57. BALSAMORRHIZA, p. 540.

Pappus present. . . . 58. WYETHIA, p. 541.

Ray-flowers not maturing achenes.

Pappus persistent; achenes thick, not notched at summit; leaves alternate, except the lowest; tall annuals or perennials. . . . 59. HELIANTHUS, p. 542.

Pappus caducous; achenes compressed, notched at apex; leaves chiefly or all radical; perennial. . . . 60. HELIANTHELLA, p. 543.

- B. Bracts of the involucre in 2 dissimilar series ("double"); flowers yellow.**
 Leaves opposite, simple or pinnately parted; pappus of persistent barbed awns. 61. *BIDENS*, p. 543.
 Leaves chiefly radical, or alternate, dissected into narrowly linear or filiform lobes; pappus not of barbed awns. 62. *LEPTOSYNE*, p. 544.

TRIBE 8. *Ambrosiææ*. RAGWEED TRIBE.

Coarse homely weeds with small greenish or white heads. Leaves alternate or the lowest opposite in no. 63. Flowers unisexual, the staminate and the pistillate in separate heads (the staminate in a raceme or cluster above the pistillate, which are few and axillary) or in the same head (solitary in the axils). Receptacle of the staminate or of the perfect heads with chaff-like bracts. Rays none. Corolla of pistillate flowers none or a mere rudiment. Anthers distinct or scarcely coherent, not caudate. Pappus none. Fruit commonly a bur.

Heads containing both staminate and pistillate flowers, the latter at the margin; involucre of 4 or 5 rounded united bracts. 63. *IVA*, p. 545.

Heads unisexual, both pistillate and staminate on the same plant; involucre of pistillate heads closed and bur-like, only the style-branches exserted; staminate heads in a raceme or spike, their involucres open.

Involucral bracts of the staminate heads united.

Pistillate involucre beaked at apex and armed near the beak with a single row of short prickles. 64. *AMBROSIA*, p. 545.

Pistillate involucre with 1 to 4 beaks and armed with several rows of prickles. 65. *FRANSERIA*, p. 546.

Involucral bracts of staminate heads distinct; involucre of pistillate heads maturing into a stout bur. 66. *XANTHIUM*, p. 546.

TRIBE 9. *Inuleæ*. EVERLASTING TRIBE.

Annual or perennial herbs. Herbage mostly white-woolly (except *Pluchea*). Leaves alternate (opposite in *Psilocarphus*), entire, or more or less dentate in *Pluchea* and *Adenocaulon*. Heads small; rays none. Bracts of the involucre frequently white or scarious. Pistillate flowers mostly with filiform corollas. Sterile flowers either perfect or staminate. Anthers caudate at base. Style-branches stigmatic to the unappendaged summit. Pappus capillary or none.

A. Receptacle with bracts (chaffy); involucral bracts few or none; woolly annuals.

Fruit-bearing bracts each enclosing its achene and falling away with it.

Achenes gibbous, the corolla and style borne laterally; pappus none. 67. *MICROPUS*, p. 547.

Achenes straight or only slightly curved, the corolla and style borne at its apex; pappus none.

Receptacle slender or columnar; leaves alternate. 68. *STYLOCLINE*, p. 548.

Receptacle globose; leaves opposite. 69. *PSILOCARPHUS*, p. 548.

Fruit-bearing bracts open, merely subtending the achenes, persistent; pappus none. 70. *EVAX*, p. 549.

Bracts of 2 kinds, the lower loosely enclosing the pistillate (fertile) flowers, the others chaff-like and surrounding a central cluster of both pistillate and sterile flowers whose achenes bear pappus. 71. *FILAGO*, p. 549.

B. Receptacle without bracts (not chaffy); involucrel bracts many (except no. 75); perennials or annuals.

Pappus present; achenes naked.

Bracts of the involucre scarious; herbage woolly.

Flowers all fertile, perfect and pistillate in the same head 72. GNAPHALIUM, p. 550.

Flowers dioecious 73. ANAPHALIS, p. 552.

Bracts of the involucre dry but not scarious; herbage not woolly. 74. PLUCHEA, p. 552.

Pappus none; achenes bearing stipitate glands; leaves broad, woolly beneath 75. ADENOCaulon, p. 553.

TRIBE 10. *Astereæ*. ASTER TRIBE.

Annual or perennial herbs or shrubs, with bland watery juice, scentless herbage (the foliage sometimes gummy or resinous) and alternate leaves. Receptacle naked. Bracts of the involucre commonly well imbricated. Disk-flowers yellow (except in some *Lessingias* and *Pentachætas*); perfect in all ours except *Baccharis*. Rays present or absent. Anthers not caudate at base. Pappus of awns or bristles (except *Bellis*).

A. Flowers of both disk and ray yellow (except in *Pentachæta*); rays present (except in no. 83 and one species of nos. 78, 80 and 82).

Pappus of several short scales; heads very small . . . 76. GUTIERREZIA, p. 553.

Pappus of several caducous awns or bristles; heads large and very gummy; involucrel bracts often squarrose; leaves not narrow, mostly serrate; perennial herbs 77. GRINDELIA, p. 554.

Pappus of persistent bristles.

Bristles 3 to 5 (sometimes obsolete); low annuals with filiform stems and leaves 78. PENTACHÆTA, p. 556.

Bristles many.

Ray-achenes without pappus or the pappus a reduced crown. 79. HETEROOTHEA, p. 556.

Ray-achenes (when present) with pappus like that of disk.

Pappus often of 2 kinds; the inner capillary, the outer very short and scale-like or obsolete 80. CHRYSOPSIS, p. 557.

Pappus of one kind.

Evergreen shrubs.

Heads solitary at the ends of the branches; pappus permanently white 81. STENOTUS, p. 558.

Heads in cymose or corymbose clusters; pappus in age reddish. 82. ERICAMERIA, p. 559.

Suffrutescent or herbaceous plants; heads in corymbs or panicles.

Rays none; corolla throat ventricose 83. ISOCOMA, p. 559.

Rays present; corolla not ventricose 84. SOLIDAGO, p. 560.

B. Flowers yellow, white, or purple; rays none, but the outer corollas often enlarged and more deeply cleft on the inner side.

Heads small, turbinate or campanulate; pappus present, its bristles commonly numerous and reddish brown in age; annuals 85. LESSINGIA, p. 561.

C. Flowers of the disk yellow (sometimes changing to purple); rays never yellow, always present (but so inconspicuous as to appear wanting in one species of *Aster* and of *Erigeron*).

Pappus none; heads on scape-like peduncles; rays white or pink-tinged; ours perennial herb 86. BELLIS, p. 564.

Pappus of disk-achenes of numerous capillary bristles.

Pappus reddish or rusty brown; pappus of ray scanty or none; perennial herbs . . . 87. CORETHROGYNE, p. 564.

Pappus dull white; pappus of ray similar to disk.

Bracts of the involucre mostly in 2 or more series, usually with herbaceous tips; rays usually numerous; perennial or annual herbs. . . 88. ASTER, p. 565.

Bracts of the involucre in 1 or 2 series, without distinctly herbaceous tips; rays very numerous and narrow; perennial or biennial herbs. . . 89. ERIGERON, p. 567.

D. Flowers whitish or yellowish, diceions; rays none.

Ours shrubs except one . . . 90. BACCHARIS, p. 569.

TRIBE 11. Eupatorieæ. EUPATORY TRIBE.

Ours herbs or suffrutescent plants with white or flesh-colored perfect disk-flowers and no rays. Receptacle naked. Anthers not caudate at base. Style-branches stigmatic only below the middle.

Leaves opposite; pappus of awns and paleæ . . . 91. TRICHOCHORONIS, p. 570.

Leaves alternate; pappus of bristles only . . . 92. COLEOSANTHUS, p. 571.

TRIBE 1. Cichorieæ. CHICORY TRIBE.

1. CICHORIUM L.

Perennial herb, the leaves mostly radical, those of the stiff branching stem reduced and bract-like. Flowers blue, in sessile heads. Receptacle without bracts. Bracts of the oblong involucre herbaceous, in 2 series, the outer 4 or 5, somewhat spreading, the inner about 8, erect. Achenes 5-angled, truncate, beakless. Pappus of 2 or 3 series of short blunt paleæ. (Altered from the Arabic name.)

1. *C. Intybus* L. CHICORY. Stems erect from a deep taproot, 2 to 4 ft. high; radical leaves runcinate-pinnatifid; heads in sessile clusters along the nearly naked branches; flowers rarely white.

Waste fields, escaped from gardens: Berkeley, Oakland, etc. Root used as a substitute for coffee.

2. SCOLYMUS L.

Erect glabrous thistle-like herb. Leaves alternate, rigid, sinuate-dentate or pinnatifid, decurrent, the lobes spinescent. Heads rather large, terminal and lateral, sessile. Flowers yellow. Bracts of the involucre in few rows, scarious-margined and spinescent-tipped, subtended by foliaceous bracts. Receptacle chaffy, the chaff more or less embracing the beakless achenes. Pappus a crown of scarious unequal paleæ. (Old Greek name.)

1. *S. Hispanicus* L. GOLDEN THISTLE. Native of the Mediterranean Region, naturalized at Los Gatos. Leaves and stalks used as food in Spain.

RHAGADIOLUS Juss. Annual herbs with yellow flowers. Bracts of the involucre in a single row, narrow, rigid, incurved, enfolding the marginal achenes, stellately spreading in age, sparingly hispid.

Receptacle naked. Achenes 5 to 10-ribbed, the ribs barbellate. Pappus of outer achenes a crown of denticulate or fimbriate scales; pappus of inner achenes double, the inner set consisting of bristles paleaceous-dilated towards the base, the outer set consisting of short scales or none.

R. HEDYPNOIS All. At first nearly simple and about 10 in. high, later becoming more or less widely branched and 2 or 3 ft. high; leaves variable in shape, the radical petioled and often lobed, the cauline sessile, entire, serrate, or with a few coarse salient teeth; flowering heads $\frac{1}{2}$ in. in diameter or less, on naked or sparingly leafy peduncles.—European weed, becoming naturalized in Sonoma Co., *Miss Eastwood*, and Mariposa Co., *Congdon*, acc. to Robinson.

SCORZONERA L. Ours a perennial herb. Heads borne on very long peduncles. Flowers yellow. Bracts imbricated in several series, the outer ovate, the inner lanceolate, all acuminate. Receptacle naked. Achenes many-ribbed, beakless. Pappus-bristles in several series, unequal, serrulate or more or less soft-hairy, some often longer and naked at the apex.

S. HISPANICA L. Viper's Grass. Plants 2 to 3 ft. high; herbage glabrous and glaucous; leaves oblong, serrulate, tapering to a petiole at base, $1\frac{1}{2}$ ft. long or less; heads in anthesis 2 in. in diameter, nodding in the bud.—Garden plant, native of Europe, cultivated for the sake of its carrot-like roots, becoming naturalized in Knight's Valley and around Calistoga, *Miss Eastwood*.

3. PTILORIA Nutt.

Tall and rather slender annual herbs, paniculately branching above. Leaves runcinate, reduced above to herbaceous bracts. Heads small, 3 to 12-flowered. Flowers pink or flesh-color, open in the early morning, the ligules all equal. Involucre cylindrical or rarely campanulate, its inner bracts linear and equal, with some short calyculate outer ones. Receptacle flat, naked. Achenes oblong or short-linear, strongly angled, glabrous, often rugose, truncate at both ends, the broad base hollowed at the insertion. Pappus-bristles white, plumose. (Greek ptilon, feathers or down, referring to the pappus.)

1. *P. virgata* (Benth.) Greene. Herbage glabrous; stem rigid, virgate or with virgate branches, 1 to 4 ft. high; upper leaves linear, small and entire; lower oblong or spatulate, often sinuate or pinnatifid; heads 3 to 4 lines long, subsessile along the naked virgate branches, 4 to 8-flowered; achenes subclavate or oblong, rugose-tuberculate between the ribs; pappus clear white, plumose almost throughout.—(*Stephanomeria virgata* Benth.)

Common on open cañon sides. Aug.—Sept. *P. CANESCENS* Greene is a form of the Bay Region characterized as "hoary tomentose when young, achenes larger and less tuberculate, pappus slightly longer and of fewer bristles." This needs comparative study.

4. PICRIS L.

Coarse rough-bristly branching biennial with leafy stems. Heads

short-peduncled, terminal or along the branches. Flowers yellow. Receptacle without bracts. Outer bracts of involucre loose and spreading, ovate, bristly-margined and spinescent at tip; inner bracts erect, linear-lanceolate. Achene somewhat flattened, transversely rugose, ours with a long and slender beak and bearing a pappus of densely plumose bristles. (Greek pikros, bitter.)

1. **P. echioides** L. BRISTLY OX-TONGUE. Two to 3 ft. high; stem hispid with barbed hairs; leaves narrowly oblong or the lower oblanceolate, sessile, rough-hispid; bracts of the outer involucre 5, subcordate at base; inner bracts long-acuminate, bearing just below the tip a pinnatifid bristle or appendage; achenes reddish, the body $1\frac{1}{2}$ lines long, the beak as long or longer; pappus copious, white.

Wayside summer weed, naturalized from Europe: abundant in the Suscol Hills and at West Berkeley; Mowry's, Alameda Co., *Davy*; Santa Clara Valley (?).

5. TRAGOPOGON L.

Stout glabrous biennial or perennial herbs, somewhat succulent. Leaves grass-like, entire, clasping. Heads large, long-peduncled, opening in the early morning, usually closed by midday. Flowers in ours purple. Involucre narrowly campanulate. Involucral bracts in 1 series, nearly equal, lanceolate, acuminate, united at the very base. Receptacle naked. Achenes muricate, 5 to 10-ribbed, long-beaked or the outermost beakless. Pappus ample, its bristles long-plumose. (Greek tragos, a goat, and pogon, a beard.)

1. **T. porrifolius** L. SALSIFY. Stems from a stout root, very leafy at base, 1 to 2 ft. high; leaves linear-lanceolate, long-acuminate; peduncle thickened and hollow below the head; heads in fruit 2 in. high; flowers deep purple; achenes cylindric, $\frac{1}{2}$ in. long, the beak nearly twice as long.

Waste places, escaped from gardens: Berkeley. June-July.

6. RAFINESQUIA Nutt.

Stout leafy glabrous branching annuals. Leaves toothed or pinnatifid. Panicle more or less corymbosely branching. Heads 15 to 30-flowered. Involucre in anthesis conical-cylindraceous. Flowers white, the ligules unequal. Receptacle flat, naked. Achenes terete, with a few obscure ribs, tapering into a slender beak, excavated at the insertion, but without callous thickening. Pappus-bristles capillary, 10 to 15, long-plumose from the base to near the tip. (C. S. Rafinesque, 1783-1840, American naturalist, celebrated for his genius and eccentricity.)

1. **R. Californica** Nutt. Stem robust, sometimes almost fistulous below, branching above, $1\frac{1}{2}$ to $5\frac{1}{2}$ ft. high; leaves oblong in outline, pinnatifid to denticulate or almost entire, sessile and auriculate-clasping or the lowermost narrowed to a winged petiole, 6 in. long or less, those of the inflorescence reduced to herbaceous bracts; heads in fruit $\frac{3}{4}$ in. high; main involucral bracts 11 to 15, linear or

lanceolate-acuminate, and with some loose subulate ones at base; beak of achene as long as the body; pappus dull white.—(*Nemoseris Californica* Greene.)

Shady or moist places in the hill country of the Coast Ranges: Pt. Arena; Oakland Hills; Mt. Diablo; Santa Cruz Mountains; Monterey Co. and southward to Southern California. June.

7. HYPOCHÆRIS L.

Herbs. Stems naked, bearing a solitary head or a somewhat corymbose cluster of long-peduncled heads. Flowers yellow. Leaves in a radical cluster or rosette, toothed or pinnatifid. Involucre campanulate or cylindrical, its bracts rather few, lanceolate, imbricated, appressed, the outer ones successively shorter. Receptacle flat, its scarious chaffy bracts thin and narrow. Achenes glabrous, upwardly scabrous, the body 10-ribbed, narrowly oblong or fusiform, tapering upward into a slender beak, or the outermost truncate. Pappus of plumose bristles, some of the outer often shorter and naked. (Greek name used by Theophrastus for some cichoriaceous plant.)

1. *H. glabra* L. Glabrous annual; stems several, erect, simple or mostly corymbosely branched, 9 to 18 in. high; leaves broadest above, denticulate, broadly toothed with triangular sinuses, or saliently lobed; heads campanulate; ligules scarcely longer than the involucre; outermost achenes truncate at summit, the others all beaked.

Naturalized weed, not uncommon in cultivated fields. May–June.

H. RADICATA L. Gosmore. Stems several from a fleshy perennial root; leaves hispid with spreading hairs, pinnatifid below the large terminal lobe into oblong obtuse lobes; rays longer than the involucre, which is disposed to twist slightly after anthesis; achenes all beaked. —Lawns at Berkeley, flowering in summer and autumn. Leafy bulblets or rosettes often form in the axils of the inflorescence, particularly late in the season.

8. UROPAPPUS Nutt.

Nearly acaulescent annuals. Leaves pinnatifid with mostly subulate or acuminate lobes or entire. Peduncles enlarged at summit, naked, each bearing a single head. Heads oblong, erect; ligules short, the heads in anthesis small. Main bracts of the involucre about equal, but with shorter ones at base, all membranous. Achenes 10 to 12-ribbed. Pappus-paleæ 5, elongated, tipped with a very short awn or bristle which proceeds from the cleft summit. (Greek *oura*, a tail, and *pappos*, pappus, on account of the bristle-like appendage to the paleæ.)

Pappus clear white, soft, deciduous from the black achenes. 1. *U. linearifolius*. Pappus dull brown or sordid, of firm texture, persistent on the light colored achenes.

Palea longer than the awn of the pappus 2. *U. Lindleyi*.

Palea much shorter than the awn of the pappus 3. *U. macrochætus*.

1. *U. linearifolius* (DC.) Nutt. Stems or peduncles often several from the base, erect, 9 to 18 in. high, in robust plants thickened or

fistulous under the oblong head; leaves linear (3 to 6 in. long and 1 to 2 lines wide) and with 2 or 3 to several pairs of more or less remote salient lobes; head at maturity (after the achenes have spread) $1\frac{1}{2}$ to $1\frac{3}{4}$ in. broad; achenes attenuate above into a beak, 5 lines long; pappus silvery white, 6 or 7 lines long, the very delicate awn about $\frac{1}{2}$ the length of the deeply notched paleæ.—(*Microseris linearifolia* Gray.)

Open ground, low hills or sometimes on higher slopes, throughout California. Apr.—May.

2. **U. Lindleyi** (DC.) Nutt. Stout, 10 to 14 in. high, the peduncle scarcely thickened under the head; leaves as in the preceding, but rather broader; achene brownish, 5 lines long, slightly narrowed toward the summit; pappus dull brown or sordid, 6 to 7 lines long, the awn from a shallow notch and very little shorter than the palea.—(*Microseris Lindleyi* DC.)

Oakland and San Mateo Co., southward to Southern California.

Var. **Clevelandi** (*Uropappus Clevelandi* Greene). Scurfy-puberulent; achenes not at all attenuate; awn less than half as long as the palea.—Plains east of Mt. Diablo.

3. **U. macrochætus** (Gray) Greene. One to 2 ft. high; involucre in anthesis narrow, 8 or 10 lines high; achenes 3 to 4 lines long, decidedly attenuate at summit; palea short, only $\frac{1}{2}$ of the length of the awn, cleft to the middle.—(*Microseris macrochæta* Gray.)

San Francisco, *Bigelow* (acc. to Gray), to San Diego.

Var. **Kelloggii** (Calais Kelloggii Greene). Achenes attenuate at each end and the palea with a shallow notch.—San Bruno Hills and Marin Co.

9. MICROSERIS Don.

Acaulescent annuals, glabrous or only slightly puberulent. Leaves in a radical tuft, pinnatifid with mostly linear and often falcate lobes, or entire. Peduncles scape-like, leafless, one-headed. Heads in anthesis narrowly oblong to ovoid or subglobose, nodding in the bud, mostly erect in fruit. Ligules short. Achenes slender-fusiform or cylindric, ribbed, mostly truncate. Pappus-paleæ 5, mostly short, abruptly or gradually passing into the scabrous awn. (Greek *micros*, small, and *Seris*, Lettuce.)

Achenes attenuate toward the apex, the upper half not filled by the seed. .

1. *M. attenuata*.

Achenes tapering slightly from base to summit or even almost turbinate, the whole cell filled by the seed.

Paleæ reduced to a triangular base or almost none, the awns fragile and deciduous 2. *M. aphantocarpa*.

Paleæ of the pappus conspicuous, the awns less brittle and more persistent.

Heads less than $\frac{1}{2}$ in. high; achenes little more than 1 line long 3. *M. elegans*.

Heads more than $\frac{1}{2}$ in. high.

Heads hemispherical in mature fruit, or nearly so; paleæ and awns rather sharply defined, the palea $\frac{1}{2}$ to $\frac{1}{3}$ the length of the awn.

Achenes obviously contracted under the summit, the outermost commonly white-villous 4. *M. Douglasii*.

Achenes not contracted under the truncate summit, the outermost sometimes villous 5. *M. Bigelovii*.

Heads turbinate in mature fruit; paleæ narrowly lanceolate, tapering into and longer than the awn 6. *M. acuminata*.

1. *M. attenuata* Greene. Scapes rather few, suberect, 11 to 15 in. high; leaves in the radical cluster few, mostly pinnately parted into narrow linear lobes; involucre $\frac{1}{2}$ in. high, barely calyculate at base; pappus 3 to $3\frac{1}{2}$ lines long, equaling or a trifle longer than the achenes; paleæ oblong or ovate, $\frac{1}{2}$ to $\frac{1}{3}$ the length of the awn, externally either lightly or conspicuously villous.

Solano Co. to Alameda Co. Apr.—May.

2. *M. aphantocarpa* Gray. Scapes decumbent at base or wholly erect, 10 to 16 in. high; leaves subentire or pinnatifid; involucre merely calyculate; achenes slender, 2 to $2\frac{1}{4}$ lines long; pappus-bristles 3 to 4 lines long, not obviously dilated at base, slender, fragile or deciduous.

Contra Costa Co. to Southern California. First collected by Brewer, no. 1206, on Bushy Knob, southeast of Mt. Diablo.

Var. *tenella* Gray. Pappus-bristles commonly but 2 or 3, with a manifestly ovate palea at base.—Napa Valley; Lower Sacramento Valley and southward. Occasionally destitute of pappus (acc. to Greene).

Var. *indivisa* (*M. indivisa* Greene). Scapes strictly erect; leaves oblanceolate, entire, or a few toothed or pinnatifid; outer row of achenes silvery-silky; pappus-bristles 4 to 5 lines long, the paleæ triangular.—Plains of Solano Co. about Elmira. Last of Apr.—May.

3. *M. elegans* Greene. Scapes slender, decumbent at base, commonly 4 to 7 in. high; head in fruit less than $\frac{1}{2}$ in. high; achenes little more than 1 line long, tapering gradually from the summit to the base; paleæ of the pappus ovate-deltoid, either obscurely emarginate or more attenuate into a slender awn about 4 times as long, the palea and the summit of the achene sometimes minutely villous.

Solano Co., where it is very common on the plains, to Contra Costa Co.

4. *M. Douglasii* Gray. Scapes 8 to 17 in. high; leaves in the rosulate radical cluster many, pinnatifid; heads broadly ovoid, or in age hemispherical, 9 or 10 lines high; achenes oblong-turbinate, thickish, obviously contracted under the summit, nearly $2\frac{1}{2}$ lines long, the outermost usually white-villous; paleæ of the pappus ovate to orbicular, 2 lines long and nearly as broad, scarious, commonly imbricated or convolutedly overlapping, abruptly acute or retuse at the apex, $\frac{1}{2}$ to $\frac{1}{3}$ as long as the awn, glabrous or villous externally.

Common from Solano Co. and Napa Valley to Berkeley and southward. Apr.—May. Specimens from the Montezuma Hills show central achenes with only 1 or 2 paleaceous awns.

5. *M. Bigelovii* Gray. Often 1 ft. high or more; leaves entire or pinnatifid; head broadly ovate, $\frac{1}{2}$ in. high; involucre disposed to be somewhat imbricated; achenes oblong-turbinate, 2 lines long, not contracted under the truncate summit, the outermost sometimes villous; pappus brownish or almost rusty, the paleæ oblong- to ovate-

lanceolate, commonly glabrous, varying in size, only $\frac{1}{2}$ to $\frac{1}{3}$ as long as the awn.—(*M. intermedia* Greene.)

Oakland, San Francisco and northward along the coast in sandy soil.

6. *M. acuminata* Greene. Scapes few, decumbent at base, 9 to 12 in. high; leaves deeply pinnatifid into slender lobes; heads narrowly oblong, in maturity turbinate, about 1 in. high; achenes glabrous, slenderly fusiform and widest above the middle, 3 lines long; pappus 7 or 8 lines long; paleæ narrowly lanceolate, gradually attenuate into an awn which is shorter than the palea.

Valleys and hills of the North Coast Ranges: Santa Rosa; Calistoga; Conn Valley; Gordon Valley (Solano Co.). Also Sierra Foothills. Well marked species.

10. *SCORZONELLA* Nutt.

Perennial herbs, with the leaves mainly in a radical tuft, the stems naked above, 1-headed, and more or less scape-like. Root fusiform. Leaves pinnatifid with linear and mostly salient lobes, or entire. Heads large, ovoid-cylindric, nodding in the bud, showy as compared with the two preceding genera, the flowers yellow and ligules elongated. Bracts of the involucre mostly thin-herbaceous, imbricated in several series. Achenes cylindric or slightly tapering downward, ribbed and obscurely angled. Paleæ 10 or more, firm, tipped with a rather long subplumose or barbellate awn. (So named because of its general aspect to *Scorzonera*.)

Pappus-bristles subplumose, the paleæ about 3 lines long; leaves laciniate-pinnatifid 1. *S. sylvatica*.

Pappus-bristles barbellate or naked. 2. *S. paludosa*.

Leaves subentire to laciniate-parted; paleæ about 1 line long 3. *S. Bolanderi*.

Leaves linear-lanceolate, entire or saliently lobed; paleæ $\frac{1}{2}$ line long 4. *S. procera*.

1. *S. sylvatica* Benth. Stem commonly simple and 1-headed, $1\frac{1}{2}$ to 2 ft. high; leaves broadly to narrowly lanceolate, laciniate-pinnatifid, the radical 5 to 8 in. long; heads 1 in. high or somewhat less; involucre bracts in 3 series, the outer ovate or ovate-lanceolate, the inner linear-oblong, all acuminate; achene 4 lines long; pappus 7 lines long; paleæ about 3 lines long, tapering into the subplumose awn which is somewhat longer.—(*Microseris sylvatica* Benth.)

Wooded hills bordering the Sacramento and San Joaquin Valleys from Yuba and Colusa Cos. southward to the eastern base of the Mt. Diablo range. Last of Apr.—May.

2. *S. paludosa* Greene. Stems several from the base, slender, 2 ft. high or more; leaves 1 ft. long, subentire to laciniate-parted into long linear lobes; head 50 to 75-flowered; involucre bracts with a lanceolate base, tapering into a long slender acumination; achene 2 lines long; pappus brownish, the paleæ little more than 1, the barbellulate awn 4 or 5 lines long.—(*Microseris sylvatica* Benth. var. *Stillmani* Gray.)

Low moist ground: Corte Madera, Marin Co. (the type locality) to Solano Co. (acc. to Greene).

3. *S. Bolanderi* (Gray) Greene. Slender plants, 1 to $1\frac{1}{2}$ ft. high; stems several, decumbent, leafy at base only; leaves linear-lanceolate, entire or with a few salient linear lobes, the radical 9 to 12 in. long, including the margined petiole; bracts attenuate from a broadish base or some outer ovate, rather regularly imbricated; pappus 5 lines long, the ovate palea $\frac{1}{2}$ line long, abruptly tipped with the long slender awn.—(*Microseris Bolanderi* Gray.)

Swampy places in the North Coast Ranges: Marin Co. northward to Mendocino and Humboldt Cos.

4. *S. procera* (Gray) Greene. Stem robust, 2 to $3\frac{1}{2}$ ft. high, leafy-stemmed, the branches long and erect; leaves entire or denticulate, the radical and lower cauline $\frac{3}{4}$ to $1\frac{1}{4}$ ft. long and 1 to 2 in. wide, the upper cauline smaller, all acuminate and tipped with a short rigid point; involucre 1 in. high and as broad or broader; outer bracts broadly ovate and abruptly short-pointed, the inner ovate to lanceolate and attenuate; achenes $2\frac{1}{2}$ lines long; pappus 5 or 6 lines long; palea 1 to $1\frac{1}{2}$ lines long; awn minutely scabrous.—(*S. maxima* Bioletti. *Microseris procera* Gray.)

North Coast Ranges: Sonoma Valley, *Torrey*, *Bioletti*; Knight's Valley, *Davy*; Cloverdale; Ukiah, *Kellogg*. June–July.

11. MALACOTHRIX DC.

Ours annual caulescent or acaulescent herbs, commonly with a radical cluster of leaves, the stems either leafy or almost naked. Heads peduncled, commonly nodding in the bud. Flowers yellow, white, or pinkish. Receptacle bristly or naked. Achenes short, glabrous, terete, 10 to 15-ribbed, or 4 or 5 of the ribs stronger than the others, truncate at apex and with an entire or denticulate border. Pappus-bristles soft, scabrous, more or less united at base and falling away together, or with 1 to 8 stronger ones which are more persistent and smoother. (Greek *malakos*, soft, and *thrix*, hair, in reference to the long wool on *M. Californica*, type of the genus.)

Bracts of involucre linear to subulate, narrowly or not obviously scarious-margined, little imbricated.

Branching, mostly glabrous; heads 3 to 4 lines high.

Flowers white or pinkish; pappus not persistent. . . . 1. *M. obtusa*.

Flowers yellow; one pappus-bristle persistent. . . . 2. *M. Clevelandi*.

Acaulescent, long-woolly when young; heads 6 to 8 lines high. . . . 3. *M. Californica*.

Bracts of involucre scarious, with green midrib, distinctly imbricated, the outer orbicular; branching and glabrous plant. . . . 4. *M. Coulteri*.

1. *M. obtusa* Benth. Stem paniculately branching above the base, 4 to 16 in. high, nearly naked; radical leaves dentate or pin-natifid, the margin often bearing scattered tufts of wool; heads small, numerous; involucre about 3 lines high, its main bracts linear, acuminate and nearly equal, with a few short ones at base, the tips usually purplish (as also in the next); achenes obovate-oblong, the summit entire, none of the pappus-bristles persistent.

Higher mountain slopes of the Coast Ranges; also in the Sierra Nevada. May-July.

2. **M. Clevelandi** Gray. One-half to $1\frac{1}{2}$ ft. high, glabrous throughout; radical leaves pinnatifid, the cauline scattered and more nearly entire; panicle narrow; heads 3 lines high, few-flowered; achenes oblong-linear, minutely striate-costate; outer pappus of one persistent bristle and a circle of white setulose teeth.—(*M. parviflora* Greene, not Benth.)

Antioch and plains bordering the eastern base of the Mt. Diablo range. Apr.-May. Bentham's type of *M. parviflora* was collected in woods near Santa Cruz.

3. **M. Californica** DC. Acaulescent; herbage conspicuously woolly when young with very long and soft hairs; leaves laciniately pinnatifid into narrowly linear or almost filiform lobes; scapes 4 to 6 in. high, each bearing one head, the heads rather large; involucre 4 to 6 lines high, its bracts narrowly linear or subulate, in about 3 ranks; bristles of the receptacle delicate, usually present; achenes narrow, lightly striate; outer pappus of 2 persistent bristles and some intervening minute teeth.

Sandy soil: Antioch to Monterey Co. and southward. Apr.-May.

4. **M. Coulteri** Gray. SNAKE'S HEAD. Simple or branching from the base, 5 to 16 in. high, the herbage glabrous and glaucescent; cauline leaves sinuately pinnatifid, broad or somewhat auriculate at the sessile base and with an elongated terminal lobe; heads subglobose, $\frac{3}{4}$ to 1 in. broad; bracts of involucre silvery-scarious with a linear central portion green, regularly imbricated in several ranks, the short outer ones orbicular, the inner oval to lanceolate or linear; achenes 15-ribbed and 4 or 5-angled, the summit obscurely denticulate by projection of the ribs; 1 or 2 stouter pappus-bristles persistent.

Frequent in the Lower San Joaquin Valley and southward to Southern California. Apr.

12. HIERACIUM L. HAWKWEED.

Ours rough-hairy perennial herbs with entire or nearly entire leaves and the heads in a panicle. Involucre cylindric or campanulate, its main bracts in 1 to 3 ranks with shorter ones at base. Achenes linear, striately ribbed, not beaked. Pappus a single row of tawny or dull white fragile capillary bristles. (Greek hierax, a hawk.)

1. **H. albiflorum** Hook. Stem nearly naked above, ending in a panicle of white-flowered heads, $1\frac{1}{2}$ to 3 ft. high; leaves and lower portion of stem thickly beset with tawny bristly hairs; leaves mostly radical, oblong, narrowed at base to a winged petiole, or the upper cauline sessile and often lanceolate and linear; involucre 3 or 4 lines high, its bracts linear-subulate; achenes $1\frac{1}{2}$ lines long; pappus dull white.

Dry woods in the mountains: Coast Ranges and Sierra Nevada. June-Aug.

13. CREPIS L.

Annuals, biennials, or perennials, similar to Hieracium, but tomentulous or glabrous, not pilose. Involucre of a single row of equal scales, or often with smaller ones at base. Flowers yellow. Achenes columnar or fusiform, 10 to 20-ribbed. Pappus copious, white and soft. (Greek krepis, a sandal, the ancient name of some plant.)

Plants glabrous; heads $\frac{1}{4}$ in. high 1. *C. virens*.
Plants tomentose; heads $\frac{1}{2}$ in. high. 2. *C. occidentalis*.

1. *C. virens* L. SMOOTH HAWKSBEARD. Annual or biennial; stem one, slender, simple below, paniculate above, 1 to 2½ ft. high; herbage green and glabrous; leaves thinnish, mostly radical, broadly oblanceolate, toothed (the teeth inclined to be salient) or shallowly pinnatifid, narrowed at base into a petiole; upper cauline lanceolate, with sessile subsagittate base; heads many, small ($\frac{1}{4}$ in. high); involucre somewhat calyculate, its bracts linear, acuminate; achenes linear-oblong, narrowed equally to each end, 10-costate, 1 line long.

Introduced weed: spontaneous at Berkeley.

2. *C. occidentalis* Nutt. GRAY HAWKSBEARD. Perennial; stems stout, one or several, branching above, 4 to 10 in. high; herbage thinly tomentose and often glandular-hirsute above, especially on the peduncles; leaves thickish, runcinately toothed, or deeply pinnatifid into linear or lanceolate lobes, the uppermost portion entire, acuminate; involucre 6 to 8 lines high, calyculate, its bracts oblong-lanceolate; achenes brown, oblong, 10 to 18-costate, 3 lines long.

Mt. Hamilton, *Brewer*, no. 1304; seldom collected in California.

14. AGOSERIS Raf.

Perennial herbs with strong and often deep taproots, or annuals. Stems naked and scape-like, bearing single large heads. Leaves in a radical tuft, elongated. Flowers yellow. Bracts of the campanulate involucre imbricated, the outer ovate, passing into the linear or lanceolate inner ones. Achenes terete, oblong or fusiform, 10-ribbed, prolonged into a slender or filiform beak. Pappus-bristles fine, copious, white or nearly white, inserted on the dilated apex of the beak. Achenes in fruit expanding and forming a globose head, the bracts of the involucre reflexed. (Greek agos, chief, and Seris, Lettuce.)

Annuals.

Ligules conspicuous 1. *A. major*.
Ligules inconspicuous 2. *A. heterophylla*.

Perennials.

Achenes tapering into the beak.

Ligules elongated, much surpassing the involucre.

Coast species.

Beak not longer than body of achene. 3. *A. apargioides*.

Beak about twice as long as body of achene. 4. *A. hirsuta*.

Interior species; beak about 3 times as long as body of achene. 5. *A. grandiflora*.

Ligules very short, scarcely surpassing the involucre; bases of the Bay hills 6. *A. plebeia*.

Achenes abruptly beaked; montane. 7. *A. retrorsa*.

1. *A. major* Jepson. Six to 18 in. high; leaves frequently pinnat-

iffid; ligules elongated and conspicuous; achenes toothed at the apex of the body and abruptly beaked; pappus dull white.

Interior districts. Apr.—May.

2. **A. heterophylla** (Nutt.) Greene. Peduncles slender, 5 to 12 in. high, often numerous; leaves linear to spatulate or oblong, entire, denticulate, or sinuate-pinnatifid, villous-pubescent; ligules short, inconspicuous; involucre campanulate; bracts lanceolate-acuminate, the inner glabrous; achenes ribbed or the inner smoothish or merely nerved, 2 lines long or less, tapering into a filiform beak $1\frac{1}{2}$ to 3 times as long, and commonly longer than the whitish pappus; fruiting heads about $\frac{3}{4}$ in. high.—(*Troximon heterophyllum* Nutt.)

Common in the hilly districts and on the plains of the Sacramento. Surface of achenes and length of beak often exceedingly variable, even in the same head. May.

3. **A. apargioides** (Less.) Greene. Low and tufted, the stems erect or ascending from a woody caudex, 7 to 14 in. high; leaves narrow, pinnatifid into slender or remote lobes or sometimes entire; heads 6 or 7 lines high; achenes $1\frac{1}{2}$ to 2 lines long, the beak not longer than the body; pappus dull white.—(*Troximon apargioides* Less.)

Sand hills of the San Francisco Peninsula.

4. **A. hirsuta** (Hook.) Greene. About 1 ft. high, the herbage short-pubescent; leaves pinnately parted into linear lobes or spatulate and merely toothed; peduncles reddish; flowers bright yellow, fading reddish; achenes $1\frac{1}{2}$ to 2 lines long; pappus commonly dull or yellowish white.—(*Leontodon hirsutum* Hook.)

Grassy hills about San Francisco Bay. June—Aug.

5. **A. grandiflora** (Nutt.) Greene. About $1\frac{1}{2}$ ft. high; herbage hirsutely pubescent or glabrate; leaves spatulate-lanceolate, sinuate-dentate to lacinate, or with salient subfalcate lobes; flowers light yellow; bracts of the involucre lanate or tomentose when young; expanded fruiting head 2 to $2\frac{3}{4}$ in. broad; achenes $2\frac{1}{2}$ to 3 lines long, the beak 10 lines.—(*Troximon grandiflorum* Gray.)

Plains of the Sacramento Valley.

Var. **intermedium** (A. *intermedia* Greene). Herbage woolly-pubescent when young; leaves pinnately parted, segments narrowly linear, rachis linear and with a linear-lanceolate terminal lobe; achenes sharply carinate-ribbed, 2 to $2\frac{1}{2}$ lines long, the beak 6 to 10 lines long; ribs along their sides more or less short-setulose.—Inner Coast Ranges: Mt. Diablo; Vaca Mountains. June.

6. **A. plebeia** Greene. Robust, $1\frac{1}{4}$ to 2 ft. high; leaves narrowly oblanceolate, pinnatifid into slender upcurving lobes, the apex disposed to be entire and slenderly acuminate; ligules short, deep yellow, scarcely or not surpassing the bracts of the involucre, which are woolly at base; body of achene 2 to $2\frac{1}{2}$ lines long, the beak 5 or 6 lines long; pappus soft and white.

Western base of the Oakland Hills.

7. **A. retrorsa** (Benth.) Greene. Very woolly-pubescent when

young, the wool more or less deciduous in age; peduncles 3 to 8 in. or even 2 ft. high; leaves not rarely as long as the peduncles, pinnately parted into narrowly linear or lanceolate retrorse segments, the rachis linear and the lobes more or less remote; outer bracts of involucre broad; inner linear and narrowly acuminate, as long as the pappus; ligules short; achenes $2\frac{1}{2}$ to 3 lines long, passing abruptly into the slender (9 or 10 lines long) beak.—(*Troximon retrorsum* Gray.)

Mountain summits from Mendocino Co. southward to Mt. Diablo and the ranges at the head of the San Joaquin Valley. May–June.

15. **LACTUCA** Tourn. Lettuce.

Tall leafy-stemmed annuals or biennials with paniced heads of yellow flowers. Leaves alternate. Involucre cylindrical or in fruit conical, its bracts imbricated in 2 or more series of unequal lengths. Rays 5-toothed at summit. Achenes obcompressed, *i. e.*, flattened parallel to the bracts, ribbed on each side, abruptly contracted into a beak, which bears at its dilated summit a copious very soft and white capillary pappus, the hairs of which fall separately. (Ancient Latin, from *lac*, milk, referring to the milky juice.)

1. **L. Scariola** L. PRICKLY LETTUCE. Stem paniculately branched above, glabrous throughout, or hirsute or prickly below, 2 to 5 ft. high; leaves oblong or oblong-lanceolate, denticulate or pinnatifid, sessile or sagittate-clasping, with a row of soft prickles on the midrib; heads numerous in an open panicle, 9 to 14-flowered; involucre cylindrical, its outer bracts about $\frac{1}{2}$ the length of the inner; rays cream-yellow; achenes narrowly obovate, about as long as the filiform beak; pappus white.

Roadsides and waste places in the Bay Region: common grain-field weed of the upper Sacramento Valley. June–July.

L. SATIVA L., Common Lettuce, may be distinguished by the unarmed midrib of the thin foliage.—An escape by roadsides at Santa Clara, *Dary*, and in Napa Valley fields, acc. to Greene.

16. **SONCHUS** L. SOW-THISTLE.

Leafy-stemmed coarse annual weeds, chiefly smooth and glaucous. Heads corymbed or umbellate, swollen at base, or jug-shaped. Involucral bracts few, thin, with many shorter ones at base; these becoming callous-thickened. Achenes obcompressed, ribbed, not beaked. Pappus copious, of cottony-white exceedingly soft and fine hairs, mainly falling together. (Greek name of the Sow-thistle.)

Leaves when sessile usually sagittate-clasping; peduncles smooth; achenes longitudinally ribbed and transversely rugose 1. *S. oleraceus*.
Leaves when sessile usually auriculate-clasping; peduncles hispid with short spreading gland-tipped hairs; achenes with 3 ribs on each side, the intervals smooth 2. *S. asper*.

1. **S. oleraceus** L. COMMON SOW-THISTLE. Stem erect, nearly simple, 1 to 3 or 4 ft. high; leaves lyrate or runcinately pinnatifid, the terminal segment commonly large and triangular, denticulate or

toothed, sagittately clasping at base, with acute lobes; lower leaves petioled; uppermost sessile and commonly lanceolate; heads about $\frac{3}{4}$ in. broad when expanded; achenes longitudinally ribbed and transversely rugose.

Naturalized European weed: old fields and waste places, flowering at all seasons.

2. **S. asper** L. PRICKLY SOW-THISTLE. Very similar to the preceding, but the leaves sometimes undivided and commonly clasping by an auricled base, the auricles rounded; achenes flat, margined with a narrow wing and marked on each side with 3 longitudinal ribs; intervals between the ribs smooth, but the ribs as well as the marginal wing rugulose or serrulate; peduncles conspicuously hirsute with spreading gland-tipped hairs.

Naturalized European weed: with the preceding but apparently not so common. There are hybrid-like intermediates.

TRIBE 2. Cynareæ. THISTLE TRIBE.

17. CENTAUREA L. STAR THISTLE.

Erect or diffuse usually rigid annual or biennial herbs with alternate leaves which are not prickly, and medium-sized heads. Involucre ovoid or globose, the bracts imbricated and ending in a needle-like prickle, or at least fringed or toothed (rarely entire) appendage. Receptacle densely bristly, the bristles persistent. Flowers yellow or purple, all tubular, the marginal much larger and neutral. Achenes notched just above the base, indicating the oblique or lateral attachment. Pappus of 2 or 3 rows of bristles or short scales or none. All our species naturalized from Europe. (Named for one of the Centaurs who used it in healing.)

Flowers yellow; leaves decurrent on the stem; achenes light gray.

Plants erect, branching mostly above the base; spines 2 to 4 lines long. .

1. *C. Melitensis*.

Plants diffuse, branching from the base; spines $\frac{1}{2}$ to 1 in. long

2. *C. solstitialis*.

Flowers purple; leaves not decurrent; achenes brown.

Middle bracts ending in a very stout spine; pappus none . 3. *C. Calcitrapa*.

Bracts devoid of spine; pappus present 4. *C. Salmantica*.

1. **C. Melitensis** L. NAPA THISTLE. TOCALOTE. Erect commonly much-branched annual, 1 to 2 ft. high, with a roughish indument, the stems winged by the decurrent leaves; lowest leaves pinnatifid, the upper narrow and mostly entire; heads mostly terminal and solitary, or 2 or 3 together, $\frac{1}{2}$ in. high; bracts rigid, the outer with palmatifid spine, the intermediate and inner ones with a rigid spine 2 to 4 lines long which is either simple or with divaricate short spines at base; flowers yellow; pappus bristles in about 3 rows, the middle row long, the outer and inner very short.

Abundant everywhere in agricultural lands and pastured hills. Probably first introduced at Napa and diffused over the state in seed grain, hence commonly known as Napa Thistle. May-June, or the dead plants persisting through the autumn into early winter, the

white bristly chaff shining in the brownish or blackish involueral cups.

2. **C. solstitialis** L. **YELLOW STAR THISTLE.** Diffuse, branching from the base, 1 ft. high, cottony-pubescent; radical leaves pinnatifid, the cauline linear, entire, rather closely ascending, decurrent into long narrow wings; heads solitary at the ends of the branches, ovoid-globular; bracts much like the preceding except that the spines of the intermediate bracts are 1 in. long or less, and the innermost bracts end in a small shining appendage; flowers very bright yellow; achenes with pappus.

Become common in recent years in the Bay Region: roadsides and vacant lots at Vacaville (first noted in 1887); low cultivated fields. Napa Valley; Shellville, Sonoma Co.; Oakland. Aug.-Sept.

3. **C. Calcitrapa** L. **PURPLE STAR THISTLE.** Coarse and rigid, forming dense bushy plants 3 ft. high, nearly glabrous; leaves pinnately divided into few linear or lanceolate lobes, or the uppermost undivided, all serrulate, not decurrent; heads large, 1 in. high, on short peduncles scattered along the branches, or in the forks, or terminal; involueral spines very stout, $\frac{1}{2}$ to 1 in. long; flowers purple; achenes brownish, over 1 line long, destitute of pappus.

Naturalized in but a few places: San Mateo; well established about Vacaville (first noted in 1887). Aug.-Sept.

4. **C. Salmantica** L. **ESCOBILLA.** Roughish-hispidulous, the stems nearly glabrous; leaves sinuately divided into triangular lobes below the large terminal ovate- or oblong-lanceolate lobe, not decurrent; heads on long slender peduncles, under 1 in. high; involueral bracts ovate, obtuse, not spine-tipped, the innermost with lanceolate scarious appendage; flowers purple; achenes with 2 or 3 rows of unequal bristles.

Introduced European species: Healdsburg, *Miss Alice King*, July, 1897.

18. CNICUS L.

Annual herb with pinnatifid or mostly sinuate-dentate leaves with spiny or prickly teeth. Heads solitary at the ends of the branches, subtended and almost concealed by the upper leaves. Bracts of the involucre imbricated in several series, the outer ovate and tipped by a simple spine, the inner lanceolate and ending in a strong pinnately branched spine. Flowers yellow. Achenes many-nerved, 10-toothed at the summit, and bearing a pappus of awns in 2 series; outer series long, naked, yellow; inner hispidulous, white. (Latin name of the Safflower, applied to thistles.)

1. **C. benedictus** L. **BLESSED THISTLE.** Pubescent, branching, 1 or 2 ft. high; leaves oblong or oblong-lanceolate, thin, upper clasping, lower petioled; heads 1 in. long.

Plains of the San Joaquin (Lathrop) and of the Sacramento.

19. CARTHAMUS L.

Ours an annual with rigid prickly pinnatifid clasping leaves.

Flowers yellow. Receptacle with linear bristle-like paleæ. Outer bracts of the involucre terminating in foliaceous appendages like the stem-leaves; inner bracts more rigid, appressed, ending in a spinescent tip. Achenes obpyramidal, with a crenulate margin at the truncate summit. Pappus-paleæ of 2 kinds, the outer unequal, ciliate, in several series, the inner in one series and much shorter; or pappus quite wanting in the outer row of achenes.

1. *C. lanatum* DC. The outer and inner involucral bracts differ very much.

Native of the Mediterranean Region: spontaneous at San Francisco.

20. *CYNARA* Vaill.

Stout perennial herb with ample pinnatifid or bipinnatifid leaves with spine-tipped segments. Flowers blue. Heads very large, solitary on the ends of the branches. Bracts of the involucre broadly ovate, obtuse or emarginate, coriaceous. Receptacle fleshy, fimbriate. Pappus of many series of plumose bristles. Achenes obovate, somewhat 4-angled. (From the Greek *kuon*, a dog, the spines of the involucre being likened to dog's teeth.)

1. *C. Scolymus* L. ARTICHOKE. One to 2½ ft. high; herbage more or less tomentose.

Garden-plant, found by waysides at Napa and Alameda and in old fields near Benicia.

21. *CIRSIIUM* Scop. THISTLE.

Stout mostly biennial herbs. Leaves alternate, prickly or spiny, commonly toothed or pinnatifid. Heads with numerous crimson, white or yellowish flowers, perfect and all alike. Corolla tubular, its segments linear-filiform. Involucre spherical to campanulate, ovoid or cylindrical, its bracts imbricated in many ranks, at least the outer tipped with a spine or prickle, rarely innocuous. Receptacle thickly clothed with soft bristles or hairs. Achenes obovate or oblong, compressed, not ribbed, smooth and glabrous. Pappus of a single series of bristles, plumose or barbellate to the middle, clavellate-dilated at tip, united into a ring at the base and deciduous as a whole. (Kirsion, Greek name of a kind of thistle.)

Stems conspicuously winged by the decurrent leaves, the wings rigid, spiny and interrupted; naturalized species 1. *C. lanceolatum*.

Stems not decurrently winged, or if decurrent, the wing not rigid or spiny; native species (except no. 2?).

A. Involucral bracts herbaceous, very broad from the appressed base to the squarrose-spreading or recurved abruptly acute apex; narrower innocuous inner ones comparatively few; heads nodding. 2. *C. fontinale*.

B. Involucral bracts not appressed-imbricated; heads leafy-bracted, clustered or not conspicuously long-peduncled, erect as in all the following.

Leaves thin, sinuately lobed, very prickly but the prickles weak; involucre somewhat cobwebby; stems succulent; common

3. *C. edule*.

Leaves thickish, pinnately parted into 3-lobed segments, ending in very stout spines; uppermost leaves lanceolate but as stoutly spinose; involucre arachnoid-woolly, its bracts cartilaginous at base; rare . . .

4. *C. Andrewsii*.

Similar to the last, but the involucre glabrous; leafy bracts few, very similar to the proper bracts and pectinate-spinose; lower San Joaquin . . .

5. *C. crassicaule*.

C. Involucral bracts appressed-imbricate in many ranks, the outer successively shorter, the slender short spine at their tip more or less abruptly spreading, the innermost erect, devoid of spine; heads naked as in all the following.

Bracts linear-lanceolate, entire, with needle-like termination.

Heads campanulate to ovate, 1 to 1½ in. high; tall glabrate plant of salt marshes . . .

6. *C. hydrophilum*.

Heads small, cylindric, 1 in. or less high; slender plant, 4 to 7 ft. high, commonly white-woolly . . .

7. *C. Breweri*.

Bracts very broad and comparatively short, entire; heads 1½ to 2 in. high; plants low, commonly ½ ft. high . . .

8. *C. quercetorum*.

Bracts roundish and dilated at apex, the margin lacerate-fringed; heads 1 to 1¼ in. high; plant 1 to 2 ft. high . . .

9. *C. callilepe*.

D. Involucral bracts not appressed-imbricated; heads naked, not leafy-bracted, on long peduncles.

Involucre broadly turbinate, its bracts elongated-oblong or linear or subulate, cuspidate or scarious at apex, lacerately fringed or entire, erect or little spreading, not squarrose, glabrate or nearly so . . .

10. *C. remotifolium*.

Involucre campanulate and its base depressed about the summit of the peduncle; outer involucral bracts prickly-tipped, stout and squarrose-spreading.

Bracts slender, spreading, straight or incurved, appressed at the very base; corollas cream-color or white, the segments shorter than the throat; Mt. Diablo range and southern Sierra Nevada.

11. *C. Californicum*.

Bracts with closely appressed base and long-lanceolate widely spreading portion, this straight, or incurved and hook-like; middle and inner Coast Ranges . . .

12. *C. Coulteri*.

Bracts straight, densely festooned with cobwebby hairs; sand hills along the coast . . .

13. *C. occidentale*.

1. **C. lanceolatum** (L.) Scop. BULL THISTLE. Plant spreading, 2 to 3½ ft. high; herbage villous and green; leaves lanceolate, deeply pinnatifid into lanceolate lobes, the callous midribs and veins excurrent as rigid spines, the base decurrent on the stem into interrupted prickly wings; upper surface strigose-setulose; heads large, almost 2 in. high, terminating leafy branchlets; bracts of involucre lightly arachnoid-lanceolate, attenuate into slender and rigid prickly pointed spreading tips; flowers rose-purple.

European species, introduced in recent years in the Bay Region: Berkeley; Lower San Joaquin, etc.

2. **C. fontinale** (Greene). Stout, about 2 ft. high, the branches widely spreading; stems and upper surface of leaves more or less glandular-pubescent; heads mostly clustered, nodding; bracts of the involucre very broad, almost 3 lines in width from the base to the abruptly acute apex, spreading or recurved from near the middle, prickly-pointed; flowers dull white; anther-tips acute.—(*Carduus fontinalis* Greene.)

Confined to a single locality near Crystal Springs, San Mateo Co., having the aspect of an introduced plant. Bracts similar to *C. quercetorum*, but the long-attenuate innocuous inner ones comparatively few.

3. **C. edule** Nutt. Stem simple, robust but tender and succulent, $3\frac{1}{2}$ to nearly 6 ft. high, pubescent and leafy to the top, the leaves thin; radical leaves 8 to 10 in. long, narrowly oblanceolate, shallowly (rarely deeply) sinuate-pinnatifid, very prickly-ciliate but the prickles weak; cauline leaves similar or oblong or narrower; heads depressed-globose, 1 to $1\frac{1}{2}$ in. high, few in a terminal cluster, leafy-bracted at base; involucre conspicuously arachnoid-woolly when young, nearly glabrate in age; bracts lanceolate-subulate, setaceous; flowers dull purple or whitish, segments of the corolla shorter than throat and with callous thickening at apex.—(*Cnicus edulis* Gray.)

Common along creeks and gulches in the Coast Ranges: San Francisco Peninsula; Oakland Hills; Marin Co. and northward. June.

4. **C. Andrewsii** (Gray). Doubtless tall and slender, branching at summit, the loose wool deciduous except from the heads; stem strongly striate; radical leaves 16 in. long, deeply sinuate-pinnatifid into 3-cleft lobes terminating in a stout spine, the outline oblong but the lobes toward the base obsolete, resulting in a prickly-margined petiole about 4 in. long; upper leaves lacinate-pinnatifid and with narrowly lanceolate prickly lobes; heads somewhat clustered or pedunculate, hemispherical, 1 to $1\frac{1}{4}$ in. high, leafy-bracted at base; involucre arachnoid-woolly, becoming flocculent; bracts with coriaceous oblong-ovate base, the short upper part greenish, and abruptly contracted into an awn-like spine; corolla apparently whitish, its segments longer than the throat.—(*Cnicus Andrewsii* Gray.)

Collected at some now unknown station in California by Dr. Andrews and named by Dr. Gray in 1874; collected since only by Miss Eastwood in a marsh near Tennessee Bay, May 31, 1896 (apparently also at Lake Merced) and distributed by her as *Carduus amplifolius* Greene; if her identification be correct Greene's name is a synonym. The radical leaves in Miss Eastwood's specimen are white-tomentose beneath, green and glabrate above.

5. **C. crassicaule** (Greene). Stems 3 or 4 ft. high, very stout below, hollow, 1 in. thick, striate, branching above, and bearing a panicle of 6 to 9 subsessile or short-peduncled heads; herbage in the mature plant gray-pubescent, especially the under surface of the leaves; leaves similar to the preceding; heads $1\frac{1}{2}$ to rather less than 1 in. high; involucre turbinate-campanulate, perfectly glabrous in age; proper bracts linear-lanceolate to lanceolate-acuminate, entire and tipped with a rather long slender prickle; leafy bracts with a few strong prickles or pectinate-spinescent, the inner sometimes apparently passing into the proper bracts; flowers whitish or pinkish; segments about as long as the throat.—(*Carduus crassicaulis* Greene.)

Roadsides and low fields of the San Joaquin between Banta and Lathrop. July. The glabrous involucre and the lanceolate-acuminate bracts will distinguish this species from the at present known forms of *C. Andrewsii*, the bracts of which are abruptly attenuate. It is not unreasonable to question this plant as a native, the Lower San Joaquin being notorious as a region furnishing alien plants which have been described as "new species."

6. **C. hydrophilum** (Greene). Tall, freely branching above, $3\frac{1}{2}$ to 6 ft. high, thinly pubescent, in maturity green and glabrate; leaves deeply pinnatifid into mostly 3-lobed segments; heads 1 to $1\frac{1}{2}$ in. high, paniculate or clustered at the ends of the branches; involucre ovate to campanulate, the bracts appressed-imbricated, narrowly lanceolate with a glutinous ridge toward the summit, tipped with a diverging prickle, perhaps the uppermost portion of the very slender bracts also diverging.—(*Carduus hydrophilus* Greene.)

Suisun Marshes; probably no more than a salt marsh form of the next.

7. **C. Breweri** (Gray). Commonly white-tomentose, sometimes nearly green, slender and tall, 5 to 8 ft. high; lower leaves ample, rather narrowly oblong, irregularly and shallowly sinuate, almost devoid of prickles; upper leaves mostly elongated-lanceolate, conspicuously prickly; heads numerous, paniculate, often rather densely so, at summit of the stem, less than 1 in. high, or oblong or oblong-ovate; bracts of the globular involucre lanceolate, much appressed, firm-coriaceous, bearing towards the apex a glandular or viscid spot or ridge; outer and middle bracts abruptly tipped with a mostly spreading weak prickle; corollas pale purple or whitish, the lobes shorter than the throat; anther-tips deltoid, merely acute.—(*Cnicus Breweri* Gray.)

Wet places in the Coast Ranges, not common: San Juan; Napa Valley; Ft. Bragg and northward to Mt. Shasta. July-Aug. Seedlings collected by the author near Sisson's, Shasta Co., have oblong-lanceolate leaves over 2 ft. long, the lower third narrowed to a winged petiole; prickles so sparse and small that the blades appear quite innocuous.

CARDUUS CYMOSUS Greene. Stem 3 to 4 ft. high, leaves white-floccose on both faces; heads $1\frac{1}{2}$ in. high; outer bracts ovate and lanceolate, closely appressed except at the stoutly spinescent tip; corolla dull white.—Alameda and Contra Costa Cos. Not seen by us.

8. **C. quercetorum** (Gray). Perennial by branching horizontal rootstocks; stem short, 4 to 6 in. (rarely 1 ft.) high, bearing a few large heads; herbage arachnoid-tomentose when young, especially on the under surface of the leaves, eventually glabrate; heads $1\frac{1}{2}$ to 2 in. high, sometimes as thick; leaves mostly petiolate, 4 to 9 in. long, pinnately parted and the oblong or lanceolate divisions often 3 to 5-cleft or -divided, strongly or weakly prickly; involucre bracts thickish, coriaceous, closely imbricated in many ranks, the outermost ovate (about 3 lines long), the inner becoming lanceolate, all with a short cusp rather less than 1 line long or sometimes blunt; innermost bracts obscurely scarious at tip; flowers purplish or whitish; four of the corolla-lobes united higher, the other longer than the throat.—(*Cnicus quercetorum* Gray.)

Coast Ranges: Fort Ross, *Setchell*; Napa, *Jepson*; Marin Co.; Oakland Hills, *Bolander*; San Juan, *Brewer*, and southward to San Diego Co. June-Aug.

9. **C. callilepe** (Greene). Stems several from the crown of the

perennial root, about 2 ft. high; leaves oblong-oblongeolate in outline, pinnately lobed, moderately prickly, bright green above, lightly arachnoid-tomentose beneath, 4 to 7 in. long; heads medium, in flower 1 to $1\frac{1}{4}$ in. high, commonly borne in pairs on longish but rather unequal peduncles; bracts of the involucre oblong, scariously margined and dilated at apex, cuspidate and lacerately fringed; innermost bracts elongated-oblong or lanceolate, ending in a scarious innocuous point; lobes of the corolla as long as the throat.—(*Carduus callilepis* Greene.)

San Francisco; Berkeley Hills; Tocaloma, Marin Co. Last of May to early July. Rather uncommon.

10. **C. remotifolium** (Gray). Plants 3 to 8 ft. high; herbage nearly glabrate, loosely arachnoid or minutely flocculent; leaves pinnately lobed to divided, the divisions of at least the lower divergently 3-lobed, more or less whitened by the loose tomentum beneath even in age; heads in flower 1 in. or at most $1\frac{1}{2}$ in. high, rather long-peduncled, naked or nearly so at base; involucre broadly turbinate, lightly arachnoid and glabrate; bracts elongated-oblong or linear or subulate, scariously margined and commonly somewhat fimbriate towards the cuspidate tip; corolla yellowish white, its segments much shorter than the throat; pappus of coarse bristles, the strongest with club-shaped tips.—(*Cnicus remotifolius* Gray.)

Dry mountain ridges from Knoxville, Napa Co., northward. Aug. In plants from Lake Co. the bracts of the involucre are frequently not lacerate nor scarcely scarious-margined. Plants from Howell Mountain referred to this species have clustered instead of solitary heads on long peduncles, and campanulate involucre.

11. **C. Californicum** (Gray). Tall and paniculately branching, often 4 to 6 ft. high, very leafy toward the base, the white wool more or less deciduous; leaves narrow, mostly about 6 in. long, from sinuately to deeply pinnatifid, moderately prickly; heads solitary on long peduncles, $1\frac{3}{4}$ to 2 in. high, naked; involucre hemispherical, somewhat woolly; bracts with coriaceous base and lanceolate spreading but incurved upper portion, the terminal prickle short; corollas cream-color, white or rarely purple; lobes shorter than the throat; anther-tips deltoid.—(*Cnicus Californicus* Gray.)

Mt. Diablo range (acc. to Greene): common in the Sierra Nevada from the Stanislaus (where first collected by Bigelow) and the Coulterville Grade to Yosemite and southward.

12. **C. Coulteri** (Gray). Stems freely branching above, $3\frac{1}{2}$ to 7 ft. high; herbage white-tomentose or becoming green; radical leaves pinnately parted into lanceolate divisions, 10 to 15 in. long; lower cauline leaves oblong, shallowly sinuate, with sparse and weak prickles, 8 in. long, decurrent for about $\frac{1}{2}$ in.; uppermost leaves lanceolate; heads large, nearly 2 in. high, on almost naked peduncles 1 ft. or more long; involucre hemispherical, less woolly than the next or nearly glabrous; bracts of involucre with appressed subcoriaceous base and the long lanceolate prickle-tipped upper portion spreading, either straight or incurved, or sometimes the outermost deflexed; inner-

most bracts erect; flowers bright crimson; corolla-segments longer than the throat; pappus-bristles barbellate above, the tips scarcely dilated.—(*Carduus venustus* Greene.)

Higher hills and mountains of the Coast Ranges from Ukiah and the Vaca Mountains to Berkeley, Mt. Diablo and southward to Forest Grove and Skyland in the Santa Cruz Mountains. June-July. A strikingly handsome species passing by numerous gradations into *C. occidentalis*. The spreading bracts are frequently developed into grappling-hook-like appendages nearly 1 in. long.

13. *C. occidentalis* (Nutt). Stout, $1\frac{1}{2}$ to 3 ft. high, very white with thick coating of cottony wool; leaves from sinuate-dentate to pinnatifid, not very prickly, glabrate above, canescent beneath; heads subglobose, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. high on nearly naked peduncles; involucre bracts straight and subulate-lanceolate, with short spines, not widely spreading, densely festooned with cobwebby hairs; flowers red or purple; corolla-segments longer than the throat; anther-tips narrow and acuminate; pappus rather scanty.—(*Carduus occidentalis* Nutt.)

Common on sandy hills near the coast, from San Francisco southward. The bracts, excepting their spiny tips, are quite concealed by the dense wool. Even at a short distance from the sea the characters are, however, less pronounced, the involucre being less arachnoid-woolly and the bracts somewhat curved or diverging from the appressed base; proceeding inland to the middle Coast Ranges, one comes to typical *C. Coulteri*, with nearly or quite glabrous involucre and characteristic bracts. This form is repeated about Mt. Shasta and in the northern Sierra Nevada but the heads and whole plant are almost snow-white woolly, when it is *Carduus candidissimus* Greene.

22. *SILYBUM* Gærtn.

Annual or biennial herb with very ample sinuate-pinnatifid prickly clasping leaves, smooth and shining above and very conspicuously blotched with white along the veins. Heads very large, solitary at the ends of the branches. Flowers purple. Corollas with filiform tube conspicuously dilated below the narrowly linear lobes. Bracts of the involucre broad, appressed, bearing an abruptly spreading spine which is broadly lanceolate or ovate and ciliate-prickly toward the base. Pappus-bristles in several series, flattish, minutely barbellate. (Old Greek name applied to thistle-like plants.)

1. *S. Marianum* Gærtn. Milk Thistle. Branching, 3 to 6 ft. high; leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, 6 to 12 in. wide, strongly undulate at the sinuses; heads about 2 to $2\frac{1}{2}$ in. broad; spines of the middle involucre bracts 1 to $1\frac{1}{2}$ in. long.

Common in abandoned fields and by roadsides throughout California. Naturalized from the Mediterranean Region. May-Aug.

TRIBE 3. *Senecioneæ*. GROUNDSEL TRIBE.

23. *PETASITES* Gærtn. SWEET COLTSFOOT.

Perennial herbs with creeping rootstocks from which arise in early

spring scape-like flowering stems (with many scales or bract-like leaves) and later ample radical leaves. Heads in a racemose corymb, subdiœcious, *i. e.*, the flowers on one plant perfect but mostly sterile, the sterile flowers with tubular 5-cleft corolla and undivided style; the flowers on another plant mostly fertile, the fertile flowers of two kinds, perfect ones with tubular 2 to 5-cleft corolla and pistillate ones with ligulate corolla, in both with style slightly cleft at apex. Flowers whitish or pinkish. Achenes 5 to 10-ribbed. Pappus elongating in age, very soft and white. (Greek petasos, a broad-brimmed hat, in allusion to the large leaves.)

1. **P. palmata** (Ait.) Gray. Stem 7 to 10 in. high, glandular-pubescent, its bract-like scales $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; leaves roundish in outline, green and nearly glabrous above, densely white-tomentose beneath, at least when young, 12 in. broad or less, palmately cleft to below the middle into 7 to 10 lobes; lobes denticulate, sinuately toothed or 3-lobed at apex; petioles 4 to 7 in. long; heads 7 lines high; bracts of the involucre rather loose; marginal flowers of fertile head ligulate, the style slender and perfectly glabrous; disk-flowers often very unequal, with slender tube abruptly dilated at the throat, and the style strongly thickened above and minutely roughened or papillate; flowers of substerile head not well known to us.

Deep shades of wooded cañons from the Santa Cruz Mountains (Loma Prieta, Forest Grove, Saratoga) to Sonoma Co., Ukiah, and northward. Mar.

24. CACALIOPSIS Gray.

Floccose-woolly perennials with mostly radical palmately cleft or parted leaves and few large rayless heads of numerous flowers terminating the stoutish stems. Involucre broadly campanulate, its bracts many, linear-lanceolate, acuminate, rigid rather than herbaceous. Receptacle naked. Anthers entire at base. Style puberulent below the slightly flattened branches. Achenes 10-nerved. Pappus copious, soft and white, equaling the corolla. (Greek kakalia, ancient Greek name of some plant, and opis, likeness.)

1. **C. Nardosmia** Gray. One to $1\frac{1}{2}$ ft. high; leaves palmately parted or cleft, the divisions broad, cleft or toothed, the radical $2\frac{1}{2}$ to $3\frac{1}{2}$ in. broad on petioles $2\frac{1}{2}$ to 4 in. long, the cauline few, similar to the radical but smaller; heads about 1 in. high, corymbosely disposed at the nearly naked summit of the stem; flowers yellow, honey-scented.—(Adenostyles Nardosmia Gray.)

Near the Geysers, Sonoma Co. ("in a pine grove; not common," Bolander, 1864); Mendocino and Humboldt Cos. and northward. Apr.—May.

25. LUINA Benth.

Cottony-pubescent low plants with many erect simple stems. Leaves alternate, entire, sessile. Heads rayless, about 10-flowered, disposed in terminal corymbs. Flowers yellow. Involucre oblong-campanulate, its bracts 8 to 10 or 12, linear, rigid, carinately 1-nerved, equal. Receptacle naked. Corolla funnelform. Anthers sagittate

at base. Style glabrous, its flattened branches papillose on the back. Pappus soft and white. (Anagram of *Inula*.)

1. *L. hypoleuca* Benth. Stems nearly 1 ft. high from a woody rootstock, white-tomentose; leaves ovate-oblong to elliptic, 1 in. long, white with wool beneath, becoming glabrous and green on the veiny upper surface; heads 5 or 6 lines high, several in an open cluster.

Plant of the coast region: Chimney Rock, Mendocino Co.; Santa Cruz Mountains, *Kellogg*, July 2, 1868, seen by the author in the Gray Herbarium, Harvard University.

26. *ARNICA* L.

Perennial montane herbs, somewhat glandular or aromatic. Leaves all opposite or the upper alternate. Heads single or several, large, at the summit of the single stem. Involucre broadly campanulate, not calyculate at base; bracts lanceolate, equal, somewhat in 2 ranks. Receptacle flat, naked. Disk-flowers many, yellow; ray-flowers pistillate when present, yellow. Achenes slender and somewhat spindle-shaped, with a callous knob at base. Pappus a single row of rather rigid and strongly roughened denticulate white bristles. (Origin of name obscure.)

Rays none; leaves more or less coarsely dentate 1. *A. discoidea*.
Rays present; leaves more or less serrate 2. *A. latifolia*.

1. *A. discoidea* Benth. COAST *ARNICA*. One and one-half to 2½ ft. high, glandular- or viscid-pubescent especially above; leaves ovate or oblong, irregularly and often coarsely dentate, rounded or truncate or cordate at base, 4 in. long or less, on petioles nearly their own length; cauline sessile, reduced, often with salient teeth, the upper sometimes alternate; heads ¾ in. high or nearly so; rays none; involucre villous-glandular; achenes sparsely hispidulous, 2 to 3 lines long.

Dry open woods: frequent in the Coast Range Mountains from San Luis Obispo to Monterey, Mt. Tamalpais, Mt. Diablo and northward beyond our limits. May-Sept.

2. *A. latifolia* Bong. Ten to 18 in. high, more or less glandular but seemingly glabrous; leaves opposite, with 3 or 4 cauline pairs, the lower ovate or roundish and petioled, the upper narrower and sessile, sharply serrate (especially the middle ones) or some entire; heads 7 to 9 lines high; rays 7 lines long.

Mt. Hamilton, *W. W. Price*, acc. to *Zoe*; Sierra Nevada.

27. *SENECIO* L. GROUNDSEL.

Herbs with alternate leaves and heads in terminal corymbs, rarely solitary. Heads many-flowered. Flowers yellow in both disk and ray, the latter pistillate or none. Involucre cylindrical to campanulate, with 1 or 2 rows of bracts of equal length, naked or with a few small short bracts at base; bracts erect or connivent. Receptacle flat, naked. Achenes terete. Pappus of abundant white and soft hairs. Style branches truncate. (From the Latin *senex*, an old man, on account of the white hair-like pappus.)

A. Annuals.

- Rays none; heads disposed to be sessile in clusters; involucre with small black bracts at base. 1. *S. vulgaris*.
 Rays inconspicuous and recurved; flower heads stalked in loose corymbs; involucre naked at base. 2. *S. sylvaticus*.

B. Perennials.

Herbs.

- Heads with rays.
 Leaves more or less bipinnately dissected or incised; heads many. 3. *S. eurycephalus*.
 Leaves coarsely dentate; heads 1 to 3. 4. *S. Greenei*.
 Leaves entire; heads many to numerous. 5. *S. Clevelandi*.
 Heads rayless.
 Herbage more or less woolly at least when young; montane plants. 6. *S. aronicoides*.
 Herbage glabrous; plants of brackish marshes. 7. *S. hydrophilus*.
 Suffrutescent plants; heads with rays; leaves divided into 3 to 7 or 9 linear lobes. 8. *S. Douglasii*.
 Climbing plants; heads rayless; leaves with reniform stipules. 9. *S. mikanioides*.

1. *S. vulgaris* L. COMMON GROUNDSEL. Slender erect branching annual, 6 to 12 in. high, glabrous or with a little loose tomentum; leaves pinnatifid with oblong lobes and dentate margin, sessile, auricled; heads in terminal corymbs or clusters; involucre 4 lines long, of about 20 equal black-tipped bracts (often penicillate at tip), with several small black ones at base; achenes slightly hairy.

Very common, naturalized weed. Feb.-Apr. Sometimes called "Old Man of Spring."

2. *S. sylvaticus* L. Very similar to the preceding but the leaves mostly linear to oblong, less pinnatifid, dentate, or nearly entire; herbage nearly glabrous; heads commonly looser in the corymb; bracts of involucre not black-tipped, the small ones at base wanting or minute; rays about 5, minute, recurved, or sometimes wanting; achenes appressed-pubescent.—(*S. aphanactis* Greene.)

Seldom seen or passed over for *S. vulgaris*: San Luis Obispo, *Brewer*, 1861; Mare Island, *Greene*, 1874.

3. *S. eurycephalus* T. & G. Stem leafy, often much branched at the summit, 1 to 2½ ft. high; herbage floccose-woolly when young, and either glabrate or not glabrate at flowering time; leaves deeply pinnatifid, the lobes cuneate-obovate, entire, coarsely serrate or incisely cleft, or the terminal portion unsegmented; heads 5 lines high, many in an ample corymb; involucre campanulate at base, somewhat contracted above, its bracts linear-oblong, somewhat acute, scarious-margined; rays 7 to 12, the ligules 6 lines long.

Open woods bordering the bases of low hills in the Coast Ranges: Palo Alto; Mt. Diablo; Geysers, Sonoma Co., *Bolander*, 1864; Atascadero Ranch, Santa Margarita Valley, *Brewer*, no. 512 (= type of *S. Breweri* Davy).

4. *S. Greenei* Gray. Stem seldom 1 ft. high, bearing 1 to 3 short-peduncled heads; herbage lightly floccose-tomentose; radical leaves roundish with abrupt or somewhat cuneate base, coarsely dentate, barely 1 or 2 in. long, on slender petioles; cauline leaves

few, sessile, uppermost lanceolate and entire, sometimes bract-like; heads $\frac{3}{4}$ in. long; bracts of involucre linear, none calyculate; rays deep orange, $\frac{1}{2}$ in. or more long; style-tips of disk-flowers conspicuously penicillate-margined and with a central cusp; achenes glabrous.

Mountain side near the Geysers, growing under bushes of *Pickeringia* and *Ceanothus*, *E. L. Greene*, June 17, 1874. Collected since only on Mt. Sanhedrin, Mendocino Co., *Rattan*, in whose specimens the lower cauline leaves are oblong, tapering to both apex and base, the petiole longer than the blade.

5. ***S. Clevelandii*** Greene. Stems commonly 2 ft. high, corymbosely branched at summit, but the inflorescence rather strict; herbage glaucous and glabrous, except the small flocs of white tomentum in the axils of the upper leaves and bracts; leaves mostly in a radical tuft, oblong, mostly 3 in. long, tapering to both ends from the middle or broadest above the middle, entire, obtuse, on petioles 3 to 5 in. long; uppermost leaves similar but smaller; heads numerous in a compound corymb, 3 lines high; rays deep orange, 2 lines long; achenes glabrous.

Northern Napa Co. (Samuels Springs to Pope Valley and north to Butt's Cañon, common in cañon bottoms and dry beds of rivulets, mostly in moist spots, July, 1897); Lake Co.

6. ***S. aronicoides*** DC. Stem robust, 1 to 3 ft. high, leafy chiefly at the base or below the middle; younger parts loosely woolly, soon glabrate; heads 5 lines high, many in a compound terminal cyme, or the inflorescence much reduced and the heads few; basal leaves ovate to oblong, 3 to 8 in. long, on petioles 5 in. long or less, irregularly and coarsely toothed, denticulate or almost entire; cauline leaves similar or mostly lanceolate, reduced and auricled at base, the uppermost bract-like; involucral bracts lanceolate, either with or without purple tips; flowers 15 to 26 or only 10 or 12; rays none, rarely 1 or 2; achenes $1\frac{1}{2}$ lines long, glabrous.

Thickets or sparsely chaparral-covered country: Mission Hills, San Francisco, *Kellogg* and *Harford*, 1868; Mt. Tamalpais; Angel Island; Grizzly Peak; Mt. Diablo; Vaca Mountains; Calistoga, etc. Common and widely distributed in the Bay Region, but variable in aspect and not abundant in any one locality. Cauline leaves often more irregularly or saliently toothed than the basal ones.

7. ***S. hydrophilus*** Nutt. Stem purplish, 2 to 4 ft. high, strict, few-leaved; herbage somewhat succulent, glabrous, more or less glaucous; leaves fleshy-coriaceous, entire or barely denticulate; the radical and lowest cauline oblanceolate and stout-petioled, 8 to 11 in. long, $1\frac{1}{2}$ in. wide, the upper cauline sessile or partly clasping; heads often very numerous, cymose-corymbose, small (5 lines high), short-pedicelled; involucre campanulate, slightly calyculate; rays none or rarely few.

Abundant in the Suisun Marshes and found in other marshes about San Francisco Bay; thence northward. May-July.

8. ***S. Douglasii*** DC. Branching from the suffrutescent base and forming a bushy plant 3 ft. high, leafy up to the inflorescence;

herbage at first whitish-tomentose, later more or less glabrate; lower leaves pinnately divided into 5 to 9 narrowly linear revolute lobes, the upper with only 3 lobes (the middle one several times larger), or the uppermost entire; heads 7 lines high; involucre broadly turbinate, the bracts linear with attenuate tips, dorsally carinate below; rays about 13, the ligules 5 lines long; achenes linear, canescent, 2 lines long.

Dry stream beds, in late summer or autumn: Putah Creek; Conn Creek (Napa Co.); and southward to the Mt. Diablo Region and Southern California.

9. **S. mikanioides** Otto. IVY SENEIO. Climbing by twining stems over shrubs and trees to a height of 5 to 20 ft.; leaves ivy-like, roundish-cordate, sharply 5 to 7-angled; petioles as long or longer; stipules reniform, present except on the uppermost leaves; corymbs more or less paniculate; heads linear-oblong, 5 to 7 lines long, the involucre about $\frac{1}{2}$ the length of the corollas.

Along streams at the western base of the Oakland Hills: Berkeley; Temescal Creek; Mills College. Jan. Introduced from South Africa.

TRIBE 4. **Anthemideæ.** MAYWEED TRIBE.

28. **ANTHEMIS** L. CHAMOMILE.

Branching ill-scented herbs with finely dissected alternate leaves. Heads solitary, on terminal peduncles. Ray-flowers white, pistillate, in ours sterile; disk-flowers yellow. Involucre hemispherical, its bracts scarious, margined with a greenish nerve, at length dry, imbricated in several series, shorter than the disk. Receptacle conical, chaffy toward the summit, the chaff slender, keeled and scarious-margined below. Achenes striate, not hairy, truncate. Pappus none. (Ancient Greek name of the Chamomile.)

1. **A. Cotula** L. MAYWEED. Branching from the base, 1 to 2 or rarely 3 ft. high, nearly glabrous; leaves pinnately dissected; heads on long naked peduncles, $\frac{3}{4}$ in. broad, including the rays; rays 14 to 20, at length reflexed; achenes rugose, the truncate summit with a very short epigynous disk.

Very common late spring or summer weed in pastures and neglected lands throughout California. Often called "Dog-fennel;" odor strong and fetid.

29. **ACHILLEA** L. YARROW.

Perennials herbs with alternate leaves, in ours pinnately divided into many fine segments. Heads in a terminal corymb, radiate; rays few, white; disk-flowers yellow; both disk and ray fertile. Involucre oblong or ovoid, its bracts imbricated, with scarious margins. Receptacle chaffy, nearly flat. Achenes strongly obcompressed, callous-margined, destitute of pappus.

1. **A. millefolium** L. COMMON YARROW. MILFOIL. Stems simple, erect or ascending at the very base, 2 to 3 ft. high; herbage

pubescent; leaves linear-lanceolate in outline, the multifid divisions crowded on the rachis; corymb compound, flat-topped; rays 4 or 5, white.

Common throughout California: along the coast, on low interior hills, and even in the most remote mountain ranges; appearing as if native. Mar.—July.

30. CHRYSANTHEMUM L.

Annual or perennial herbs, ours with toothed or incised leaves. Heads large, solitary on leafy-bracted peduncles. Disk-flowers yellow; rays yellow or white. Receptacle flat or hemispherical, naked. Achenes glabrous, at least those of the disk 5 to 10-ribbed all around. (Greek *chrysos*, gold, and *anthemon*, a flower.)

1. *C. segetum* L. CORN CHRYSANTHEMUM. Annual, erect, 1 to 2 ft. high; herbage glabrous; lower leaves pinnatifid or incised; upper merely denticulate, sessile by a clasping base; heads (including the yellow rays) 2 in. wide; ray achenes 3-sided.

Fields at West Berkeley; Mendocino City. May—June.

C. LEUCANTHEMUM L. Ox-eye Daisy. Involucral bracts with dark red margins; rays white.—Sierra Nevada; reported from Santa Cruz.

31. MATRICARIA L.

Ours glabrous annuals with pinnately dissected leaves. Heads solitary or somewhat corymbose, with many greenish yellow flowers. Receptacle slender-conical, naked. Bracts of the involucre imbricated, with scarious margins, persistent. Corollas tubular, without limb. Rays none. Pappus reduced to a membranous crown or border, or none. Achenes glabrous, 3 to 5-nerved on the sides, rounded on the back. (Latin *matrix*, because used medicinally.)

Heads 2 to 4 lines high; achenes with an obscure margin at summit. . . .

Heads mostly 4 to 6 lines high; achenes with a broad crown, or a lobed 1-sided pappus. . . . 1. *M. discoidea*.
 2. *M. occidentalis*.

1. *M. discoidea* DC. Branching, 2 or 3 to 10 in. high; herbage sweet-scented; heads short-peduncled, 2 to 3 or 4 lines high; bracts of the involucre broadly oblong.

Common in beaten roadways, about old farm buildings and in pasture lands throughout California. Apr.—May.

2. *M. occidentalis* Greene. Either branching or unbranched below the corymbose summit, $1\frac{1}{2}$ to 2 ft. high; herbage not so strongly scented; heads as much as $\frac{1}{2}$ in. high; achenes sharply angled, with a broad crown-like margin, or lobed and 1-sided.

Rich soil of fields: Sacramento Valley; San Francisco and southward to Southern California.

32. TANACETUM L.

Strong-scented perennial herbs. Leaves 2 or 3 times pinnately divided into numerous small lobes. Heads discoid, many-flowered,

in a corymb-like peduncled cluster. Flowers yellow. Involucre of numerous scale-like bracts. Receptacle flat or low, naked. Achenes 5-ribbed or 3 to 5-angular, with broad truncate summit bearing a low crown-like pappus or none.

1. **T. camphoratum** Less. DUNE TANSY. Villous-tomentose when young, the wool more or less deciduous in age; herbage with the aroma of camphor; stems robust, decumbent or ascending, 1 to 2½ ft. long; primary and secondary divisions of the leaves much crowded, the latter oval or oblong, the margin more or less revolute; achenes glandular.

Sand-dunes at San Francisco. Aug.-Nov.

33. **ARTEMISIA** L. SAGE BRUSH.

Herbs or shrubby plants, mostly bitter and aromatic, with alternate leaves. Heads small, nodding or erect, in paniced spikes or racemes. Flowers yellow or purplish, all tubular; disk-flowers perfect and marginal ones pistillate or all perfect. Rays none. Corolla of the pistillate flowers 2 or 3-toothed, of the perfect flowers 5-toothed. Involucre imbricated, dry and scarious. Receptacle nearly flat, naked. Achenes obovoid or oblong, glabrous, with a small terminal areola. Pappus none. (Named for Artemisia, wife of Mausolus, king of Caria.)

Shrub; herbage grayish-puberulent; leaves linear-filiform and entire or with linear filiform divisions; involucre hemispherical.

3. *A. Californica*.

Herbaceous or somewhat woody at base.

Involucre oblong; leaves green above, commonly white-tomentose beneath, broad, often pinnatifid 1. *A. heterophylla*.

Involucre hemispherical.

Herbage green, glabrous; leaves bipinnately divided, the divisions serrulate or incised 2. *A. biennis*.

Herbage green and nearly glabrous; leaves linear, entire 4. *A. dracunculoides*.

Herbage densely silky-villous all over; leaves once to twice pinnately divided into linear entire segments 5. *A. pycnocephala*.

1. **A. heterophylla** Nutt. CALIFORNIA MUGWORT. Stems erect, woody at base, strict, 3 to 6 ft. high; leaves lanceolate to oblong, ovate or elliptic, sparingly pinnatifid (with downward incisions), cleft or often entire (especially the upper), green above, white-tomentose beneath, sometimes glabrous; heads mostly erect, in dense spikes in an open or more commonly dense terminal panicle, the main axis leafy; involucre oblong, glabrous; marginal flowers pistillate, disk-flowers perfect, all fertile, as also in the next two species.

Common along stream-banks and elsewhere throughout California. Leaves usually large, often 6 in. long and 2½ in. broad, exceedingly polymorphic as to the margin. Treated (and perhaps more wisely) as *A. vulgaris* L. var. *Californica* Bess. in the Botany of California.

2. **A. biennis** Willd. Glabrous inodorous tasteless biennial, erect, virgate, 1½ to 3 ft. high; leaves bipinnately divided into lanceolate or broadly linear incised or serrulate divisions, or the uppermost only pinnatifid; heads crowded on the short branchlets, the

whole inflorescence spike-like and more or less leafy; achenes with small epigynous disk.

Introduced weed: West Berkeley, *Greene*, 1888; Lower Sacramento, *Jepson*, 1893.

3. **A. Californica** Less. HILL BRUSH. Gray shrub, $2\frac{1}{2}$ to 4 ft. high; leaves with a minutely appressed pubescence, the lowest palmately once or twice parted into linear-filiform segments, the upper entire and more or less fascicled; heads many, nodding in long racemose panicles; involucre $1\frac{1}{2}$ or 2 lines broad; achenes with a minute squamellate crown-shaped pappus.

Exposed slopes of hills: Berkeley, and through the Mt. Diablo range southward. Called "Old Man" in some regions.

4. **A. dracunculoides** Pursh. Glabrous, not aromatic, perennial; stems 2 to $4\frac{1}{2}$ ft. high, either virgately or paniculately branched; leaves linear, less than 1 to 2 lines broad, entire or the lowermost 3-toothed or -cleft; heads numerous, nodding on very slender short peduncles in a close or open panicle, the clusters sometimes secund on the slender branches; marginal flowers fertile, disk-flowers perfect but sterile, as also in the next.

San Leandro Creek, *Bolander*, acc. to Bot. Cal.; common in the Sierra Nevada.

5. **A. pycnocephala** DC. Stems stout, simple, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high, somewhat woody at base, crowded with leaves up to the inflorescence; herbage densely silky; leaves once to thrice pinnately divided into linear lobes; heads erect, in spikes, the spikes crowded in a dense virgate panicle; heads almost or quite 2 lines in diameter; involucre densely villous.

Sand hills along the coast from Monterey to Humboldt Co.

34. COTULA L.

Low strong-scented herbs. Leaves alternate, dissected or lobed, or with some entire on the same plant. Flowers yellow. Heads slender-peduncled, discoid, low-hemispherical. Bracts of involucre greenish, in about 2 ranks. Receptacle flat or nearly so, naked. Outer series of flowers pistillate only and apetalous. Disk-flowers with 4-toothed corolla, fertile or infertile. Mature achenes raised on pedicels, compressed, spongy-margined or narrowly winged, destitute of pappus. (Greek kotule, small cup or low vessel.)

Annual; leaves pinnately dissected; pistillate flowers in 2 or 3 rows

1. *C. australis*.

Perennial; leaves some pinnatifid and some entire, sheathing at base; pistillate flowers in a single row 2. *C. coronopifolia*.

1. **C. australis** Hook f. Slender, branching, 2 to 5 in. high; herbage with scattered soft spreading hairs; leaves pinnately or bipinnately dissected into linear lobes; heads very small, 1 to $1\frac{1}{2}$ lines broad; bracts of involucre brownish-tipped and with scarious edges; pistillate flowers in 2 or 3 rows, pediceled; disk-flowers nearly or quite sessile; marginal achenes somewhat compressed, minutely hispid on both faces but the margin glabrous.

Streets of towns and cities: Berkeley, *Davy*; Oakland; San Francisco. Jan.—Mar.

2. **C. coronopifolia** L. Perennial, somewhat succulent, often subaquatic; stems commonly many and clustered, decumbent, $\frac{1}{2}$ to 1 ft. long; leaves linear, lanceolate, or oblong, entire, coarsely toothed or pinnatifid on the same plant, dilated at base into a short sheath round the stem; heads depressed, 4 to 5 lines broad; pistillate flowers in a single row, on pedicels $\frac{1}{2}$ as long as the involucre, without corolla; disk-flowers on much shorter pedicels.

Saline localities everywhere and in springy places in the hills, most abundant in salt marshes about San Francisco Bay and flowering from Mar. to Dec.

35. **SOLIVA** R. & P.

Small depressed annual with rigid short branches, petioled and pinnately dissected leaves, and discoid heads of greenish flowers sessile in the forks. Involucre of 7 or 8 greenish nearly equal bracts. Receptacle flat. Outer series of flowers pistillate and apetalous; innermost flowers perfect but sterile, the corolla 4-toothed. Achenes obcompressed, callous-margined or winged and pointed with the hardened persistent style. Pappus none. (Named in honor of Dr. Salvador Soliva.)

1. **S. sessilis** R. & P. Plants 2 to 4 in. across, minutely pubescent or rusty villous; one, two, or three heads sessile at the very base, the somewhat tortuous stems radiating from under these; involucre bracts 7 or 8, oblong, acute, pilose-pubescent; pistillate flowers 9 to 12; each wing of the achene terminating above in an incurved tooth; staminate flowers fewer than the pistillate, 7 to 9; styles stout, subulate, conspicuously exerted beyond the disk-corolla.

Moist ground, Mendocino Co., *Bolander*; Howell Mountain, *Jepson*; Angel Island; Oakland, *Davy*; Forest Grove and southward to Santa Barbara. Probably naturalized from Chile. Mar.—May.

TRIBE 5. **Heleniæ.** SNEEZEWEED TRIBE.

36. **JAUMEA** Pers.

Perennial glabrous herbs. Leaves linear, entire, fleshy, opposite and connate at base. Heads middle-sized, many-flowered, solitary, terminating the branches, the peduncles thickened at apex. Flowers yellow, the rays pistillate, all fertile. Involucre cylindraceous-campanulate, its bracts broad and imbricated, the outermost short and fleshy. Receptacle naked, conical. Corolla glabrous. Style-branches of the disk-flowers thickened upward and papillose. Achenes linear, striately 10-nerved. Pappus (in ours) none. (Named for I. H. Jaume St. Hilaire, French botanist.)

1. **J. carnosà** (Less.) Gray. Stems slender but rather rigid, many from the fleshy crown of the taproot, mostly simple, 4 to 6 in. long, decumbent at base and rooting at the nodes; leaves semi-terete, $\frac{3}{4}$ to 1 in. long; heads $\frac{1}{2}$ in. high; rays about 6.

Salt marshes about San Francisco and Suisun Bays; beaches along the California coast. Summer and autumn.

37. *LASTHENIA* Cass.

Glabrous slightly succulent annuals. Leaves opposite, entire, sessile and more or less connate at base. Heads on slender peduncles. Flowers yellow, with 5 to 15 rays. Bracts of the involucre more or less united into a hemispherical or campanulate toothed cup. Receptacle conical or subulate, covered with projecting points which bear the linear or linear-oblong flattened achenes. Pappus of 5 to 10 paleæ or none. (Named for a Greek girl who attended the lectures of Plato in the garb of a man.)

Pappus none; rays conspicuous.

Bracts united only below the middle; tube of corolla short-hirsutulous . . .

1. *L. conjugens*.

Bracts united above the middle; tube of corolla nearly glabrous

2. *L. glabrata*.

Pappus of 5 to 10 paleæ, 2 or 3 awn-pointed; rays very inconspicuous; bracts united above the middle 3. *L. glaberrima*.

1. *L. conjugens* Greene. Succulent or sometimes slender, 5 to 12 in. high, pubescent with short scattered hairs; leaves narrowly linear, with linear segments, or merely toothed, or the lowest entire; involucre bracts united only toward the base; corolla-tube usually hirsutulous; achenes polished, less than 1 line long.

Subsaline fields: near Antioch; Newark, etc. Apr.

2. *L. glabrata* Lindl. Usually branching above the base, 11 to 16 in. high; leaves linear and entire or sometimes the upper pair broadly lanceolate and toothed, conspicuously connate and sheath-like at base; peduncles elongated, erect; involucre broadly hemispherical; ligules about 5 lines long, the entire head $\frac{3}{4}$ to 1 in. wide.

Borders of salt marshes.

Var. *Californica* (L. *Californica* DC.). Leaves less or scarcely at all connate; peduncles corymbose.—Plains and low hills. May.

L. CHRYSANTHA Greene has the obovate-oval compressed achenes surrounded by a border of short closely packed clavate hairs.—Upper San Joaquin Valley.

3. *L. glaberrima* DC. Stems ascending, simple, 5 to 14 in. long; leaves linear, entire; heads on short peduncles, nodding in the bud, about 3 lines broad, seemingly rayless, the rays very small and inconspicuous; involucre with about 15 short teeth; corollas all shorter than their achenes; achenes minutely puberulent; pappus of 5 to 10 rigid paleæ; 2 or 3 of them subulate-pointed or short-awned, the others erose or lacinate; achenes with short stiff hairs.

Half-aquatic in winter pools or in wet fields: near the coast and eastward to Alvarado and Mt. Diablo. May–June.

38. *BÆRIA* F. & M. GOLD FIELDS.

Low and mostly slender annuals (*B. macrantha* is perennial). Herbage commonly pubescent but never hoary. Leaves opposite,

linear and entire, or laciniate-pinnatifid. Flowers yellow, the heads on slender peduncles. Rays 5 to 15, showy for the size of the heads, or sometimes very short. Involucre campanulate or hemispherical, its bracts as many as the rays, ovate or oblong and becoming more or less carinate below the middle. Receptacle subulate-conical. Achenes linear but somewhat broadened upward. Pappus of paleæ or awns or both or none. (Dedicated to the Russian zoologist, Bær.)

- A. Pappus of one or more awns and several blunt paleæ, usually alternating, sometimes wholly wanting in the same species; pubescence soft-hairy or none; at least some of the leaves pinnatifid or toothed.
- Insular species 1. *B. maritima*.
Mainland species.
Plants slender.
Pappus-awns usually 4 2. *B. Fremonti*.
Pappus-awns usually 2 3. *B. tenella*.
Plants stoutish; leaves broadly ligulate with few or several salient linear lobes 4. *B. uliginosa*.
- B. Pappus uniform, paleaceous; pubescence as in the last section; leaves entire or pinnatifid.
Involucre campanulate or hemispherical; rays conspicuous.
Leaves filiform and entire; salt marsh species 5. *B. carnosa*.
Some leaves pinnatifid; alkaline plains 6. *B. platycarpa*.
Involucres very narrowly cylindrical; rays so short that the heads are seemingly rayless; leaves very narrow, entire 7. *B. microglossa*.
- C. Pappus uniform, of awn-like paleæ or bristles; pubescence hirsutulous; leaves entire or often serrate in no. 10.
Annuals.
Pappus none 8. *B. chrysostoma*.
Pappus usually present.
Pappus of awn-like bristles 9. *B. gracilis*.
Pappus with the awns paleaceous at base 10. *B. hirsutula*.
Perennial; nearly simple; peduncles 4 to 8 in. long; pappus none or present 11. *B. macrantha*.

1. *B. maritima* Gray. Stoutish, branching, 3 or 4 in. high, slightly villous, especially on the margins of the involucral bracts; leaves linear or oblong-linear, entire or some sparingly toothed; rays 6 to 8, short and broad; pappus of 3 to 5 slender awns, with intervening laciniate paleæ; achenes appressed-pubescent with short hairs.

Farallone Islands.

2. *B. Fremonti* (Benth.) Gray. Erect, slender, 7 to 13 in. high; herbage nearly glabrous below, rather finely pubescent on the peduncles and involucres, or the involucres nearly canescent; leaves narrowly linear and entire, or mostly parted into linear lobes; involucre broad, its bracts 10 to 12, broadly ovate; rays as many or fewer, with oval ligules shorter than the width of the disk; pappus of about 4 slender awns and as many or more numerous very small paleæ, or seldom none.

Plains from Solano Co. southward. Mar.-Apr. Involucres nearly canescent.

3. *B. tenella* (Nutt.) Gray. Erect, sparingly branching, 5 to 8 in. high, somewhat canescent; leaves linear and entire or some of the lowest laciniate; rays 6 to 8, oval or oblong, little or not at all exceeding the disk; paleæ and awns each usually 2 or often wanting.

Plains of eastern Contra Costa Co. Apr.-May.

4. **B. uliginosa** (Nutt.) Gray. Nine to 12 in. high, at length loosely branched and diffuse, villous-tomentose when young, commonly glabrate; leaves linear-ligulate, laciniate-pinnatifid (especially above the middle) or the upper sometimes entire, the larger 4 to 10 in. long, the undivided (or ligulate portion) often 4 lines broad and conspicuously nerved; involueral bracts and oblong exserted rays 10 to 13; awns 3 or 4, with about 6 short intervening paleæ, or pappus sometimes none.

Low grounds, San Francisco Peninsula. Apr.—June. Perhaps but a variety of *B. tenella*.

5. **B. carnosa** Greene. Stems about 9 in. high, simple or branched from the base, slender and wiry, very sparsely clothed with a fine deciduous wool; leaves somewhat succulent, all filiform and entire; bracts of involucre fleshy, about 7, with a single strongly carinate midrib; pappus of 4 or 5 ovate paleæ, each bearing a subulate awn; achenes roughish.

Salt marshes at Vallejo, *Greene*, Apr. 15, 1883.

6. **B. platycarpha** Gray. Stems purplish and wiry, branching, 5 to 8 in. high; leaves narrowly linear, some pinnatifid into filiform divisions; bracts of the involucre 6 or 7, manifestly 3-nerved at base, the middle nerve at length carinately thickened; pappus-paleæ bright white, 5 to 7, slender-awned, the awn as long as the achene.

Alkaline plains of the interior: Byron, etc. Apr.

7. **B. microglossa** (DC.) Greene. Very slender and but a few in. high; leaves scarcely 1 line wide, entire; heads few-flowered, very narrowly cylindrical, the rays very short and inconspicuous and thus apparently rayless; bracts of the involucre 3 or 4, narrowly oblong, achenes fusiform-linear; pappus-paleæ 2 to 4, attenuate-subulate.

South Coast Range valleys: Mt. Diablo; San Francisco Bay and southward to Southern California.

8. **B. chrysostoma** F. & M. Stems slender, freely branching, 7 to 11 in. high; herbage hirsutulous; leaves narrowly linear, 1 line wide or less, entire; heads 3 or 4 lines high; rays and bracts of the broad involucre 7 to 12, or in depauperate plants often fewer; ligules 3 or 4 lines long; pappus none.

Coast Range hills and valleys. Apr.—May.

9. **B. gracilis** (DC.) Gray. Slender, 5 to 7 in. high; leaves narrowly linear, entire; bracts and rays 10 to 12, when depauperate 5 or 6; ligules 2 or 3 lines long; achenes linear-cuneate; pappus of 3 or 4 awns from small lanceolate paleæ, almost as long as the achene, or the pappus none.

Common in the Coast Range hills. Apr.—May.

10. **B. hirsutula** Greene. Often branching very freely, 3 to 4 in. high, hirsute-pubescent; leaves broadly linear, often with saliently projecting teeth, the lower connate, sheathing the stem; involueral bracts obovoid, acutish; rays oblong; achenes compressed, scabrous with short sharp points; pappus of 2 to 5 brownish awn-like bristles or none.

Open hills near the sea: Point Lobos; Point Reyes, etc. May. Very similar in appearance to *B. maritima*.

11. *B. macrantha* Gray. Perennial, simple or nearly so, 7 to 18 in. high, the peduncles 4 to 8 in. long; leaves 2 to 6 in. long, 2 lines wide, more or less 3-nerved and obtuse, hispidly ciliate, at least toward the base, entire; head about $\frac{1}{2}$ in. high and 1 to $1\frac{1}{2}$ in. broad; involucre of about 12 hirsute-pubescent thickish herbaceous bracts; rays 5 to 8 lines long; pappus none or of 1 to 4 bristles.

Along the coast from Marin Co. (Point Reyes) to Mendocino Co. (Ft. Bragg, etc.). Last of May-June. Specimens from Point Reyes, *Davy*, collected within the space of a few square feet show the following variations as to the pappus: Plant no. 1.—Pappus none. Plant no. 2.—Only one flower found with a single pappus bristle. Plant no. 3.—Pappus none, rudimentary (reduced to a minute scale) or with one good bristle. Plant no. 4.—Pappus of 2 or 3 or 4 (mostly 4) bristles. Other specimens show corresponding variations.

39. *MONOLOPIA* DC.

White-woolly annuals with alternate sessile entire or low-denticulate leaves and large peduncled heads of golden yellow flowers. Involucre hemispherical, its bracts united into a cup with broad or triangular teeth, or distinct to the base. Receptacle conical, naked. Rays with 3 or 4-toothed ligules and bearing at base and opposite the ligule an oblong or roundish denticulate appendage. Lobes of disk-corollas somewhat hairy. Achenes angular, black. Pappus none. (Greek mono, single, and lopus, husk, on account of the bracts of the involucre in one series.)

Bracts united into a toothed cup 1. *M. major*.
Bracts distinct to the base 2. *M. gracilens*.

1. *M. major* DC. Stoutish, simple or branching, 8 to 20 in. high; tomentum floccose and tardily deciduous; leaves mostly oblong-lanceolate, low-denticulate, or commonly entire, 4 in. long or less; bracts of the involucre united into a broadly campanulate cup (6 to 7 lines broad) with triangular teeth; rays 3 or 6 to 10 lines long.

Petaluma and the lower Sacramento Valley, and southward through the South Coast Ranges and the San Joaquin Valley to Southern California.

2. *M. gracilens* Gray. Slender, paniculately branched, 10 to 15 in. high; leaves narrowly oblong to linear-lanceolate, low-denticulate or entire; involucre 3 or 4 lines broad, its bracts distinct to the base; rays 2 or 3 lines long; achenes less than 1 line long.

Santa Cruz Mountains. June.

40. *ERIOPHYLLUM* Lag.

Annual or perennial herbs or suffruticose plants. Herbage white-woolly, deciduous or floccose. Leaves alternate, divided or incised. Involucre oblong to hemispherical, its bracts distinctly rigid and permanently erect. Receptacle flat or convex. Rays 4 to 13 or 15,

broad. Tube of disk-corolla commonly glandular and hairy. Achenes linear or cuneate-linear. Pappus of firm pointless paleæ. (Greek erion, wool, and phullon, leaf, the herbage woolly.)

Suffrutescent; heads small except no. 3.

Heads in close terminal clusters; involucre obovoid to oblong.

Rays 6 to 8. 1. *E. stæchadifolium*.

Rays 4 or 5. 2. *E. confertiflorum*.

Heads peduncled in a loose corymb; involucre campanulate-hemispherical; rays 6 to 8. 3. *E. Jepsonii*.

Herbaceous; heads larger, scattered on rather long peduncles; involucre hemispherical.

Leaves broadish; coast species. 4. *E. arachnoideum*.

Leaves narrower; interior species.

Annual. 5. *E. idoneum*.

Perennial: var. *grandiflorum* of 6. *E. lanatum*.

1. *E. stæchadifolium* Lag. LIZARD TAIL. Two or 3 ft. high; leaves pinnately parted into 5 or 7 lobes, these again pinnately parted or toothed or entire, the margins revolute and the under surface white with a dense felt-like tomentum; upper surface of leaves green and the tomentum of the stems deciduous; heads 4 or 5 lines high, disposed in close compact corymbs; involucre broadly oblong or somewhat turbinate, bracts linear; rays 6 to 8; pappus-paleæ 9 to 12, those at the angle of the achene longer.

Sandy hills and fields near the ocean. July-Sept.

2. *E. confertiflorum* (DC.) Gray. Stems $1\frac{1}{2}$ to 2 ft. high, often unbranched, with a close dense (at length deciduous) tomentum; flowering branches very leafy but the leaves small and ternately or pinnately parted into 3 to 7 narrowly linear divisions; heads $1\frac{1}{2}$ to 2 lines high, many in compact terminal clusters; involucre obovoid-oblong, its bracts about 5, ovate; rays 4 or 5, $1\frac{1}{2}$ to 2 lines long; paleæ 8 to 10, nearly equal, about $\frac{1}{2}$ as long as the achene.

Hill and mountain summits of the Coast Ranges. June-July. Greene's var. *discoideum* from Sonoma Co. is rayless.

3. *E. Jepsonii* Greene. Bushy, 2 ft. high; stems white with tomentum, the leaves soon green or greenish; leaves pinnately divided into 5 to 7 narrowly linear lobes; heads 3 to 4 lines high, peduncled in a loose corymb; involucre broadly campanulate-hemispherical, its bracts 6 to 8, ovate; rays elliptical or oblong, 4 lines long, ovate; achenes hispidulous; pappus-paleæ in two unequal series, those of the inner set exceeding the outer.

Mountains between Arroyo Mocho and Arroyo Valle south of Livermore. May.

4. *E. arachnoideum* (F. & M.) Greene. Much branched, decumbent at base, 1 ft. high or more; tomentum deciduous or becoming thin on the under surface of the leaves; leaves broadish (at least some of them 1 in. broad), cleft into 3 to 5 triangular or oblong lobes or variously incised or toothed; involucre hemispherical, its bracts oblong or oblong-ovate, acute; rays 10 to 13, 4 or 5 lines long; pappus-paleæ short.

Mountains towards the coast: Marin Co. May-June.

5. **E. idoneum**. Branching from the base, 12 to 16 or 30 in. high, the herbage at first woolly, later deciduous and floccose; leaves mostly basal, linear-spatulate or obovate in outline, lacinate or pinnatifid, green above, the tomentum mostly persistent on the under surface; heads solitary on long naked peduncles or the heads somewhat corymbosely clustered and the peduncles shorter; involucre hemispherical, 3 or 4 lines high, its bracts broadly lanceolate, appearing as if united or connivent by reason of the dense felt-like tomentum; rays 9 to 12; ligules elliptic, 5 to 6 lines long, sharply notched at summit, with a small tooth in the notch; pappus-paleæ about 9, very short.

Vaca Mountains (where it is undoubtedly annual); Napa Co. hills. May.-June.

6. **E. lanatum** (Pursh.) var. **grandiflorum** Gray. Whole plant white-woolly, the tomentum tardily deciduous, 1 or 2 ft. high; leaves ovate or obovate in outline, pinnately divided into narrow toothed or pinnatifid segments; peduncles long and naked; involucres broadly hemispherical (8 lines broad); rays about 11, $\frac{1}{2}$ in. long and over one-half as wide.

Hillsides, Peaceful Glen Valley, Solano Co.; Sierra Foothills. May.-June.

41. **RIGIOPAPPUS** Gray.

Slender annual with alternate very narrowly linear entire leaves. Heads small, solitary on the simple stems or on the branches, which are often proliferous. Receptacle flat, naked. Bracts subulate, similar to the upper leaves. Flowers yellow. Ray-corollas not exceeding the disk, the ligule not longer than the tube. Disk-corollas small, with 3 to 5 short erect teeth. Pappus in disk and ray of 3 to 5 subulate awns. Achenes linear. (Greek rigios, stiff, and pappos, pappus.)

1. **R. leptocladus** Gray. Three or 4 to 10 in. high, the herbage short-hairy or nearly glabrous; branches filiform; heads 3 lines high; achenes hispidulous.

Wooded hills: North Coast Ranges; Tehama Co.; Sierra Foothills. June.

42. **CHÆNACTIS** DC.

Ours annuals with alternate pinnately parted or dissected leaves and yellow flowers. Heads peduncled, solitary or cymosely arranged. Bracts of the campanulate involucre herbaceous, linear, equal, in one series. Receptacle flat, naked. Corollas with short tube and long throat, or the marginal corollas in some species with the limb palmately enlarged, forming a kind of ray. Pappus of hyaline paleæ, the paleæ in the outer flowers commonly shorter and fewer. (Greek chaino, to gape, and aktis, ray, in reference to the marginal flowers of one section of the genus.)

Stems short, leafy mostly at base, the peduncles long and scape-like; paleæ commonly 4, equal or nearly so 1. *C. lanosa*.

Stems taller, more leafy, and peduncles shorter.

Paleæ of the disk-flowers 4, equal. 2. *C. glabriuscula*.

Paleæ of the disk-flowers unequal.

Pappus of 5 paleæ much shorter than the corolla and of 2 minute outer ones. 3. *C. gracilentia*.

Pappus of 4 paleæ as long as the corolla and of 2 very short ones. 4. *C. heterocarpha*.

1. *C. lanosa* DC. Herbage whitish with floccose wool which is later deciduous; stems leafy only at the branching base, bearing many long peduncles which are naked and scape-like; leaves thickish, simply pinnate with few narrowly linear and mostly short lobes or the upper entire; pappus-paleæ 4, sometimes 5, equal or nearly equal, narrowly oblong or oblong-lanceolate, acutish.

Monterey Co.; reported from the Lower San Joaquin; not seen within our limits.

2. *C. glabriuscula* DC. Thinly floccose, at length glabrous, 5 to 11 or 19 in. high; leaves pinnately parted into narrowly linear lobes or the uppermost linear and merely toothed or entire; heads 5 to 7 lines high; bracts of the involucre thickish; marginal corollas ample, much longer than those of the disk; pappus-paleæ 4, oblong-lanceolate, those of the disk equal, of the marginal achenes with 1 long and 3 short ones; short paleæ of the ray relatively broader or even elliptical.

Antioch; Sierra Foothills; Coast Range foothills west of Red Bluff. Apr.

3. *C. gracilentia* Greene. Simple below, corymbosely branching above, 7 or 8 in. high; leaves 1 or 2 in. long, with narrowly linear rachis bearing oblong lobes (1 line long) or short teeth; heads 3 or 4 lines high; marginal corollas little ampliate; achenes black, sparingly hispidulous with white hairs; pappus-paleæ commonly 5, unequal, oblong-oblancoate, $\frac{1}{2}$ to $\frac{1}{4}$ as long as the achene, with 2 very small roundish outer ones.

Dry ridges east of Napa Valley. June.

4. *C. heterocarpha* Gray. Three-fourths to 1½ ft. high, with corymbose peduncles or often simple and 1-headed; herbage hoary-tomentose but soon glabrous. Leaves pinnately or bipinnately parted, the lobes short, unequal, crowded; heads 6 lines high on long peduncles; marginal corollas conspicuously enlarged, surpassing the disk; pappus of disk-achenes of 4 elliptic-oblong paleæ equaling the corolla and of two or more roundish and shorter outer ones; paleæ of marginal flowers much shorter.

Lake Co. (acc. to Gray); Upper Sacramento Valley and southward in the Sierra Nevada.

C. DOUGLASII H. & A. Corollas whitish or flesh-colored, the marginal not larger; paleæ 8 to 14, narrowly oblong.—Sierra Nevada.

C. NEVADENSIS Gray. Low tufted perennial, 2 to 4 in. high; peduncles 1 in. or less long, 1-headed.—High Sierras.

43. HELENIUM L. SNEEZEWEED.

Erect perennial herbs with resinous-dotted herbage. Leaves alternate, sessile except the lower, and often decurrent on the stem.

Heads solitary or corymbose, borne on long naked peduncles. Flowers yellow, or the lobes of the disk-corolla turning yellowish or brownish. Rays several, usually drooping. Bracts of the involucre linear, reflexed. Receptacle globose or hemispherical, naked. Achenes turbinate, ribbed. Pappus of 5 to 12 thin or hyaline paleæ, in ours short-pointed. (Greek name of some plant, perhaps named after Helenus, son of Priam.)

Rays shorter than the disk, 3 to 5 lines long 1. *H. puberulum*.
 Rays as long or longer than the disk, 7 to 9 lines long 2. *H. Bigelovii*.

1. *H. puberulum* DC. ROSILLA. Puberulent, paniculately branched, 2 to 5 ft. high, the branches ending in long slender peduncles; leaves lanceolate or narrowly linear or the longest oblong, sessile and strongly decurrent on the stem; globose disk of flowers 5 to 7 lines broad; rays and bracts of the involucre reflexed, short and inconspicuous; disk-flowers red-brown; scales of pappus ovate, short-awned.

Creek beds, stream banks and about springy places: Humboldt Co.; Vaca Valley; San Francisco; San Jose; Loma Prieta; Monterey and southward to Southern California. July–Nov.

2. *H. Bigelovii* Gray. BIGELOW'S SNEEZEWEED. Stem 2 to 4 ft. high, branching above into several erect peduncle-like branches; leaves lanceolate, thickish, 9 in. long or less, minutely tomentose, not so conspicuously decurrent as in the preceding; rays showy, golden yellow, 7 to 9 lines long; disk brownish yellow; pappus-paleæ 5 to 8, ovate-lanceolate, tapering into a slender awn; achenes hairy.

Marshy ground in the North Coast Ranges; first collected by J. M. Bigelow at Santa Rosa Creek.

44. BLENNOSPERMA Less.

Low annual herbs with alternate pinnately parted leaves and peduncle-like branches bearing solitary yellow flowers. Involucre simple, parted into broadly oblong bracts. Receptacle naked. Heads many-flowered. Ray-flowers fertile; disk-flowers perfect but sterile. Achenes obovate, not compressed or angled, densely covered with minute papillæ. Pappus none. (Greek blenna, mucus, and sperma, seed, the surface of the achene becoming conspicuously mucilaginous when moistened.)

1. *B. Californicum* (DC.) T. & G. Stems branching from near the base, becoming diffuse, 4 to 6 in. high, often naked above; herbage glabrous, slightly succulent; leaves parted into narrowly linear remote lobes; involucre greenish with purple markings; ray-flowers 8 to 11, the ligule of the corolla 2 to 3 lines long, or the alternate pistils destitute of corolla; style-branches of ray-flowers broad; disk-flowers 20 to 45, shorter than the involucre, their styles undivided, capitate at summit; achenes obscurely 8 to 10-ribbed.

Not infrequent in moist ground, from the upper Sacramento Valley to Southern California; Ukiah; Kenwood, Sonoma Co.; Vanden, Solano Co.; Antioch; Danville; Livermore Pass. Feb.–Mar.

TRIBE 6. *Madieæ*. TARWEED TRIBE.45. *MADIA* Mol. TARWEED.

Glandular-viscid heavy-scented erect annual or perennial herbs. Leaves, at least the upper, alternate, entire or serrate. Heads axillary and terminal. Flowers yellow, opening in the evening and closing before noon of the next day. Involucre angled by the salient carinate or almost conduplicate bracts; bracts in 1 series, completely enfolding the laterally compressed ray-achenes, and with free moderately long or short tips. Receptacle flat or convex, bearing a single row of chaffy bracts between ray- and disk-flowers and often united and forming a cup. Disk-corollas in ours pubescent. Rays few to many, 3-lobed. Bracts of involucre deciduous with the mature ray-achenes, these beakless (except in no. 5). Disk-achenes fertile or abortive. (*Madi*, the Chilian name.)

A. Receptacle glabrous.

Achenes beakless.

Rays very short and inconspicuous; achenes of ray curved; pappus none.

Plants stoutish and viscid-glandular; heads in clusters.

Herbage ill-scented 1. *M. sativa*.

Herbage honey-scented 2. *M. capitata*.

Plants slender and moderately glandular; heads scattered. 3. *M. dissitiflora*.

Rays showy; achenes of ray incurved; leaves some or mostly opposite; pappus present. 4. *M. madioides*.

Achenes with a minute reflexed beak; rays $\frac{1}{2}$ in. long; pappus none. 5. *M. radiata*.

B. Receptacle fimbriate-hirsute.

Achenes beakless, those of the ray not incurved; pappus none; rays showy. 6. *M. elegans*.

1. *M. sativa* Molina. CHILE TARWEED. Robust, 1 to 4 ft. high, pubescent with slender hairs and beset with pedicellate very viscid glands; ill-scented; leaves from broadly lanceolate to linear; heads 5 to 6 lines high, short-peduncled or sessile, disposed in the upper axils and at the ends of short branches; bracts of involucre hispid; rays 5 to 12, with pale yellow ligules about 2 lines long; cup of receptacle campanulate and enclosing many disk-achenes, these cuneate-oblong and 4-angled, prominently 1-nerved on the sides and 2 lines long; ray-achenes somewhat falcate-obovate, either with or without an obvious nerve on the sides.

Common in vacant lots, waysides, etc., about San Francisco. Doubtless naturalized from Chile. July-Aug.

2. *M. capitata* Nutt. Erect, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; simple or branching; herbage very viscid-glandular, honey-scented; leaves linear; heads somewhat longer than in the preceding, capitate-congested at the ends of the branches; bracts of involucre short-bristly; cup of receptacle narrow and nearly closed, containing very few achenes; bracts of involucre and achenes semi-persistent.

North Coast Ranges; Gilroy; Santa Cruz.

Var. *anomala* (*M. anomala* Greene). Chaffy bracts of receptacle

not joined into a cup, enclosing 3 flowers only; achenes all gibbously obovate, those of the rays 3 to 5.—Marin Co.

3. *M. dissitiflora* (Nutt.) T. & G. Very slender, 1 to 2 ft. high, simple or loosely branching, moderately or scarcely at all viscid, at least below; flowers sulphur-yellow; heads 3 (or barely 4) lines high, scattered or loosely paniculate; cup of receptacle ovoid but not closed, containing few disk-flowers; rays 5 to 8, $1\frac{1}{2}$ to 2 lines long; achenes short and broad (1 to 2 lines long).

Stream banks, open bushy places or wooded slopes in the mountains: North Coast Ranges to the Santa Cruz Mountains (where very slender forms pass into coarser forms, as much as $3\frac{1}{2}$ ft. high, by every gradation).

4. *M. madioides* (Nutt.) Greene. WOODLAND MADIA. Perennial (or sometimes biennial?); stem or stems from the base simple, bearing a terminal corymbose panicle of long slender and nearly naked branches, $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high; some or most of the leaves opposite, linear, a few varying to lanceolate, 4 in. long or less, entire or sparingly denticulate; bracts of the involucre 8 to 12, with short tips; rays acutely 3-lobed, 3 or 4 lines long; only ray-achenes fertile, these much flattened, curved and somewhat obovate, the surface covered with minute muriculations and the sides with many striæ; pappus of very short fimbriate or hairy paleæ.—(*M. Nuttallii* Gray.)

Wooded country near the coast from Monterey to Bolinas Ridge, *Setchell*, and northward. June.

5. *M. radiata* Kellogg. Stem stout, 2 to 3 ft. high; hirsute and viscid; larger leaves broadly lanceolate, denticulate; bracts of the involucre 10 to 20, with short tips; rays light yellow, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, obtusely 3-toothed; chaffy bracts between ray and disk united; disk-flowers very numerous on a nearly flat glabrous receptacle, fertile, except the central ones, somewhat clavate and 4-angular; ray-achenes narrowly obovate-falcate, flat, tipped with a minute reflexed beak.

Near the mouth of the San Joaquin River.

6. *M. elegans* Don. COMMON MADIA. Stem 1 to 3 ft. high; lower leaves linear, 3 to 8 in. long, short-hirsute, often densely so; upper leaves much reduced in size, linear-lanceolate; herbage, particularly above, viscid with short gland-tipped hairs, the involucre and peduncles more or less hirsute with white hairs; heads many in a corymbose panicle; receptacle convex, fimbriate-hirsute; rays 12 to 15, $\frac{1}{2}$ to nearly 1 in. long, yellow or with a red spot at base; achenes flattish, light brown or blackish, smooth.

Variable and abundant species found on dry hillsides and in valley fields. July–Oct. The var. *DENSIFOLIA* (*M. densifolia* Greene) has the leaves crowded toward the base or tufted.

46. HARPÆCARPUS Nutt.

Small slender viscid-glandular annual with sweet-scented herbage and narrow entire mostly alternate leaves. Head small, few-flowered, borne on naked filiform peduncles. Flowers yellow; corolla glabrous.

Ray-flowers 4 to 8, the ligules minute. Disk-flower 1, the bracts of the receptacle united and forming an enclosing cup, the receptacle otherwise naked. Achenes slender, laterally compressed. Pappus none. (Greek harpe, a sickle, and karpos, fruit, on account of the shape of the ray-achenes.)

1. *H. exiguus* (Gray) Greene. Paniculately branched, commonly 4 to 6 in. high, the leaves narrowly linear; heads $1\frac{1}{2}$ to 2 lines long; bracts of the involucre 4 to 8, lunate and strongly carinate, the free tip scarcely any, very hispid-glandular; ray-achenes obovate-lunate, pointed by a small disk.—(*Madia filipes* Gray.)

Open brush or woods in the mountains of the Coast Ranges: northern California; Napa Mountains; Cazadero, *Setchell*; Oakland Hills; Pajaro Hills and southward to Southern California.

HEMIZONELLA Gray. Near *Harpæcarpus* but the leaves mainly opposite; disk-flowers solitary or rarely 2 to 4; rays minute. *H. PARVULA* Gray. Much branched, 2 or 3 in. high; heads subsessile or on slender peduncles; achenes tipped with an incurved beak.—Sierra Nevada; Chamiso Mountain, Mendocino Co., *Rattan* (seen in the Gray Herbarium, Harvard University). *H. MINIMA* Gray. One in. high; achenes beakless.—Sierra Nevada.

47. *HEMIZONIA* DC. TARWEED.

Viscid-glandular and ill-scented annuals with alternate (or the lowest sometimes opposite) narrow leaves. Flowers yellow or white, in mostly numerous heads. Disk-flowers surrounded by a circle of chaffy and often slightly united bracts or the disk chaffy throughout. Receptacle flat, its bracts deciduous. Ray-achenes thick, short, turgid, half enclosed by the lower part of the bract of the involucre which falls with it or is at least deciduous. Disk-achenes sterile, with or without pappus. This and the two following genera were perhaps better received as one. (Greek hemi, half, and zonia, zone, the bracts but half enclosing the fruit.)

A. Ray-achenes not beaked.

Receptacle with chaffy bracts throughout; areola of ray-achenes nearly or quite central at the summit of the achene; disk-achenes without pappus.

Rays scarcely surpassing the bracts of the involucre . . . 1. *H. congesta*.

Rays showy, much surpassing the bracts of the involucre.

Heads paniculate or corymbose . . . 2. *H. luzulaefolia*.

Heads racemously disposed along simple branches . . . 3. *H. Clevelandi*.

B. Ray-achenes beaked.

Receptacle with a circle of bracts surrounding disk-flowers, otherwise naked; leaves without truncate glands.

Rays 12 to 25; pappus minute or none; heads hemispherical . . . 4. *H. corymbosa*.

Rays 5; pappus of linear paleæ; heads very narrow.

Heads on slender pedicels . . . 5. *H. Kelloggii*.

Heads fascicled in small clusters . . . 6. *H. fasciculata*.

Receptacle with chaffy bracts throughout; leaves of the branchlets with small truncate glands at tip; pappus none.

Rays 4 or 5; leaves crowded on the branchlets . . . 7. *H. virgata*.

Rays 5 to 8; leaves scattered on the branchlets . . . 8. *H. Heermannii*.

1. *H. congesta* DC. Soft-hirsute or villous, the inflorescence slightly glandular; lowest leaves commonly opposite, oblanceolate, sparsely serrulate, the upper linear or linear-lanceolate and entire; heads terminating paniculate or corymbose branches; bracts of the involucre with lanceolate foliaceous tips, which are little surpassed by the rays; outer bracts of the receptacle either lightly connate or nearly distinct; achenes with conspicuous inflexed stipe.

First collected by Douglas "in California," doubtless between Monterey and Sonoma; not known to us; attributed by Greene to Marin Co., etc.

2. *H. luzulæfolia* DC. HAY-FIELD TARWEED. Whole plant excepting the lowest leaves very glandular and ill-scented; stems erect, 1 to 2 ft. high, corymbosely or paniculately branched at summit, or branching more freely and diffuse; lower leaves crowded and more or less tufted, narrowly linear, mostly tapering somewhat to the apex, 3 to 5 in. long, 1 or 3-nerved, canescent with appressed soft silky hairs which are more or less floccose-deciduous; upper leaves much reduced; heads numerous, on short peduncles, which are nearly naked or bear very much reduced leaves; tips of the involucreal bracts acute or obtuse; outer bracts of the receptacle united into a cup; rays 6 to 10, white or pink-tinged; achenes with very short stipe.

Abundant in mowed hay fields and pasture lands: Sacramento and San Joaquin Valleys and westward through the Coast Range hills and valleys to the ocean. July-Oct.

Var. *lutescens* Greene. Flowers yellow.—Fields near the Bay, in Contra Costa, Napa, and Marin Cos.

Var. *citrina* (*H. citrina* Greene). Lowest leaves glandular-pubescent, without appressed woolly hairs; flowers lemon-yellow.—Northern Marin Co. Apr.—May.

3. *H. Clevelandi* Greene. General habit of the preceding, but the herbage much less glandular; involucre white-hairy toward the base; heads disposed to be racemose on the branches as well as terminal.

Lake Co.; to be expected in eastern Napa Co.; rarely collected.

4. *H. corymbosa* (DC.) T. & G. COAST TARWEED. Corymbosely and widely branching, 1 to 1½ ft. high, hirsute-pubescent and glandular; radical and often some lower leaves pinnately divided into linear lobes, the upper and those of the flowering branches linear and entire; heads ½ in. high, 7 to 10 lines broad; rays 12 to 25, oblong-cuneate, 2 to 4 lines long, 3 or 4-toothed; pappus of the sterile disk-achenes of minute fimbriate-bristly scales, or of entire scales, or none; ray-achenes with a short upturned beak on the inner side at apex.—(*H. angustifolia* DC.)

Abundant in valley fields and on hillsides: Berkeley to Santa Cruz and Monterey Co. June-July.

5. *H. Kelloggii* Greene. Erect, paniculately branching, 1½ to 2½ ft. high, the heads on slender pedicels; herbage mostly hispid below and glandular above; leaves linear and entire, those of the

filiform flowering branchlets very short; lower leaves pinnately parted; heads narrow; disk-flowers about 6 or 7; ray-flowers 5, the ligules 2 to 2½ lines long; ray-achenes slightly curved, roughened on the beak and sides, and with a curved or upturned beak at the summit on the inner side; pappus of about 9 linear paleæ which are irregularly lacerate at summit and almost or quite as long as the tube of the corolla, united only at base or almost to the summit.

Antioch to the San Joaquin Valley where it is abundant in low grain fields near the river. July-Aug.

6. *H. fasciculata* (DC.) T. & G. Paniculately branched above the base, $\frac{3}{4}$ to 2 ft. high, sparsely hirsute and hispid, or disposed to be nearly glabrous above; radical leaves pinnately parted; stem leaves linear, either laciniate-pinnatifid, few-toothed or entire, those of the branchlets shorter and mostly entire; heads usually fascicled in rather dense small clusters; bracts of the involucre glabrous or glandular-hispidulous, those of the involucre slightly united; disk-achenes with a pappus of 6 to 10 linear paleæ lacerate at tip; ray-achenes smoothish or transversely rugose, with a very short beak.

Mt. Diablo Range southward to Monterey Co. and Southern California.

7. *H. virgata* Gray. Stem commonly branching at the middle into several virgate branches bearing numerous racemously disposed heads on short lateral branchlets; herbage glabrous or nearly so; branchlets crowded with linear leaves about 1 line long, those (particularly of the flowering branchlets) ending in a truncate or somewhat saucer-shaped gland; involucre oblong, its bracts 5, with involute tip ending in a truncate gland and stipitate-glandular on the back; ray-flowers 4 or 5; disk-flowers 7 to 10.

Common on the plains of the Sacramento Valley (Suisun, Vanden, Galt, etc.) and the San Joaquin Valley and in the valleys of the inner South Coast Ranges. Aug.-Oct.

8. *H. Heermanni* Greene. Stems paniculately branched, 1 to 3 ft. high; herbage viscid, pubescent, heavy-scented; leaves of the flowering branchlets minute, scattered; involucre hemispherical, its bracts beset with stalked glands; ray-flowers 5 to 8, disk-flowers 10 to 15; ray-achenes with a somewhat conspicuous beak and stipe.

Mt. Diablo Range southward to Kern Co. and Southern California.

48. *HOLOCARPHA* Greene.

Corymbosely branching annual with very viscid-glandular herbage. Leaves of the axillary fascicles and those about the heads narrowly linear, beset with stipitate glands and tipped with a truncate gland. Heads solitary or commonly glomerate at the ends of the branches. Bracts of the convex receptacle each subtending a flower, the outer and those of the involucre abundantly covered with slender or clavate colorless gland-tipped processes. Ray-flowers many, with short yellow ligules; achenes 4-ridged on back, the ventral angle ending in a beak. Disk-flowers with sterile achenes. Pappus none. (Greek holos, whole, and karphe, chaff, the whole receptacle chaffy.)

1. **H. macradenia** (DC.) Greene. ADELINE TARWEED. Branching from above the base, about 1 ft. high; herbage unpleasantly odorous; lower leaves linear-oblong, laciniate; heads $\frac{1}{2}$ in. broad.

Low dry fields about San Francisco Bay. Aug.-Sept. Connects *Hemizonia* with *Centromadia* too intimately.

49. **CENTROMADIA** Greene. SPIKEWEED.

Rigidly branching annuals with alternate spinescent leaves and involucre bracts, the lower pinnatifid, the upper entire. Herbage more or less glandular and scented. Flowers yellow, with 25 to 40 small bifid rays. Receptacle with chaffy bracts throughout, none of the outer united or connate. Disk-achenes chiefly sterile, with or without narrowly linear or bristle-like paleæ. Ray-achenes more or less triangular, smooth or roughish on the back, the inner terminated by an erect beak-like apiculation. (Greek *kentron*, a prickle, and *Madia*, an allied genus.)

Herbage yellowish green, sparsely hirsute, sweet- or honey-scented; floral leaves little or not at all surpassing the heads. 1. *C. pungens*.
Herbage dark, rather densely villous-hirsute, ill-scented; floral leaves often conspicuously surpassing the heads. 2. *C. Fitchii*.

1. **C. pungens** (H. & A.) Greene. COMMON SPIKEWEED. Herbage sparsely hirsute or hispid with spreading hairs, hardly viscid or glandular; stems rigidly and freely branching, commonly from near the base, sometimes only above, 1 to 2 or 3 ft. high; leaves (especially of the flowering branches) linear-subulate, spinose, entire, the lower and lowest pinnately parted into oblong lobes, or pinnatifid, the lobes or teeth spinosely or pungently tipped; bracts of the receptacle cuspidate; pappus of disk none; ray-achenes roughish, somewhat laterally 2-nerved on back.—(*Hemizonia pungens* T. & G.)

Abundant on the plains of the Lower San Joaquin, southward to Southern California and westward to Walnut Creek and Alameda (whence Greene's *C. maritima*). On the alkaline plains of the Upper San Joaquin this species covers tens of thousands of acres and often forms thickets 4 or 5 ft. high. It is a valued bee plant; "car-loads of Spikeweed honey are shipped annually from Fresno Co.; the honey is of amber color, good quality and granulates quickly," *O. L. Abbott*.

Var. **Parryi** (*C. Parryi* Greene). Minutely glandular; bracts of receptacle thin, not pungent; disk-achenes with 3 to 5 slender almost bristle-like paleæ as long as the corolla; ray-achenes semi-obcordate in outline.—*Calistoga*; Vacaville (= *C. rudis* Greene, the achenes either smooth or rough warty). It is abundant in low more or less alkaline lands on the plains of Solano Co. and forms extensive colonies in summer fields; extermination is often accomplished by means of bands of sheep which leave the fields perfectly clean and destitute of this Spikeweed pest.

2. **C. Fitchii** (Gray) Greene. FITCH'S SPIKEWEED. Diffusely branched from above or at the base, 9 to 16 in. high, the herbage hirsute or villous with spreading hairs; leaves of the radical tuft pinnately parted into remote narrowly linear pungent lobes; cauline

leaves linear and entire, tapering into a subulate or pungent tip, those about the head spreading and star-like, mostly all bearing stipitate glands; bracts of the involucre subulate, those of the receptacle pointless, soft, hairy; ray-achenes flattened laterally, nearly semi-circular in outline, smooth; pappus of disk-achenes of 9 to 11 linear paleæ as long as the corolla and hairy or fimbriate at the tip.—(*Hemizonia Fitchii* Gray.)

High sandy land in the valleys and foothills: Sierra Foothills and the Lower San Joaquin northward through the Sacramento Valley and westward to Napa and Sonoma Cos. Aug.—Sept.

50. **CALYCADENIA** DC. ROSIN WEED.

Erect annuals, hirsute or hispid or almost glabrous. Stems simple, or with virgate branches, or repeatedly branched. Leaves all entire, narrowly linear, becoming filiform by revolution of the margins, at least those near the heads and those of the fascicles in the axils bearing at apex tack-shaped or saucer-shaped glands. Heads oblong or narrow. Flowers white or yellow. Ray-flowers few (1 to 5 or 8), the ligules broad and palmately 3-lobed or -parted; ray-achenes obovoid-triangular, the areola at summit quite or nearly in the center; pappus none. Disk-flowers surrounded by a circle of bracts connate into a cup, or at length separating; disk-achenes with conspicuous paleaceous pappus. (Greek *kalux*, covering, and *adenos*, a gland, on account of the glands on the involucre.)

Rays 5 to 8; flowers yellow; plants for the most part very glabrous.
I. *C. truncata*.

Rays 1 to 5.

Flowers white or reddish-tinged.

Stems repeatedly branched; branches filiform . . . 2. *C. pauciflora*.

Stems simple or with virgate branches.

Pappus-paleæ unequal; floral leaves not truncate. 3. *C. multiglandulosa*.

Pappus-paleæ subequal; floral leaves truncate. . . 4. *C. spicata*.

Flowers yellow; stems simple 5. *C. hispida*.

1. ***C. truncata*** DC. ROSIN WEED. Stems 1 to 3 ft. high, reddish brown, simple below, branching above into a panicle of long straight slender branches along which the heads are scattered; herbage glabrous or the linear and entire leaves somewhat hirsute-ciliate; smaller leaves with subsessile glands at apex; heads oval, 4 or 5 lines long; rays 5 to 8, broad, 4 to 5 lines long; ray-achenes glabrous, triangular, roughish and enclosed in boat-shaped bracts; bracts of the receptacle lightly cohering to the top into a cup, separating in age; disk-flowers 10 to 20; pappus of 7 to 10 unequal oblong fimbriate paleæ shorter than the achene, or rarely obsolete.—(*Hemizonia truncata* Gray.)

Dry hills in the North Coast Ranges: Napa Valley; Sonoma and northward. Sept.

2. ***C. pauciflora*** Gray. Branching freely, 10 to 18 in. high, the branches diverging or zigzag and filiform; herbage sparingly hairy and leaves (particularly about the heads or of the axillary fascicles) stipitate-glandular; heads oblong, scattered along the branches (sub-

sessile in the axils or forks, as well as terminal), always solitary; flowers white or rose-tinged; rays 1 or 2, 3-parted; disk-flowers 3, contained in a 3-lobed cup; pappus of 5 subulate-awned paleæ and 5 small truncate paleæ; ray-achene glabrous.—(*Hemizonia pauciflora* Gray.)

Mountain sides of the inner North Coast Ranges from the Vaca Mountains northward to the Clear Lake region. July.–Aug.

3. *C. multiglandulosa* DC. Sparingly hirsute or hispid, especially toward the base of the leaves, 6 to 11 (or 16) in. high; herbage with a pleasant balsamic odor, the floral leaves and involucre glandular with stipitate glands; leaves filiform-linear, mostly straight and rigid but brittle, the upper somewhat divaricately spreading and mostly 2 or 3 times longer than the heads and floral leaves in the axils; heads solitary in the axils or crowded towards or near the summit and spicate or capitate; pappus-paleæ commonly 10, some (commonly 5) subulate, others (commonly 5) shorter and blunt.—(*C. cephalotes* Greene.)

Dry hills and mountain slopes: Marin Co., southward to the Santa Cruz Mountains. July–Sept.

4. *C. spicata* Greene. Slender, simple, rigidly erect, about 1 ft. high; floral leaves terete, truncate at apex and tipped with a stipitate gland, ciliate with white hairs; heads subsessile in the axils of all the leaves from below the middle and thus spicate; ray-flowers 1 or 2; achenes canescent with appressed hairs, those of the ray scarcely angled; pappus brownish, the paleæ 10 or 11, subulate, $1\frac{1}{2}$ times as long as the achene; corolla-lobes of disk-flowers hispidulous.

Common on the plains of the San Joaquin Valley between Oakdale and La Grange. June.

5. *C. hispida* Greene. Erect, simple, 2 ft. high; leaves 2 to $2\frac{1}{2}$ in. long, or the fascicled ones much shorter, all hispid, at least towards the base; heads rather large ($\frac{1}{2}$ in. long) on short axillary branchlets; flowers yellow; rays about 4; corolla-lobes of disk-flowers densely covered on the outside with many short glandular processes or slender papillæ; achenes hispid with short brownish appressed hairs; pappus of about 11 subequal paleæ tapering to a point.

Lower San Joaquin Valley near Lathrop. June.

51. BLEPHARIZONIA Gray.

Stout somewhat coarse and hirsute annuals with glandular-viscid ill-scented herbage. Cauline leaves linear and entire, those of the branches oblong to oval. Flowers yellow, the heads arranged in panicles. Ray-flowers 7 to 10, with 3-lobed ligules; disk-flowers 10 to 25, the outer ones subtended by 1 or 2 series of linear bracts. Achenes silky-hirsute, 10-striate; those of the disk more or less fertile, crowned by a pappus of about 20 short and stout densely plumose awns; those of the ray fertile, elongated-turbinate, the pappus like that of the disk or dissimilar and minute. (Greek *blepharis*, an eyelash, and *zonía*, a girdle, in reference to the circle of pappus-awns.)

Pappus of disk and ray unlike. 1. *B. plumosa*.
 Pappus of disk and ray similar. 2. *B. laxa*.

1. *B. plumosa* (Kell.) Greene. Two to 3 ft. high, copiously beset above with tack-shaped glands; leaves on the branchlets small and bract-like; heads 15 to 20-flowered, racemosely disposed on the branches; bracts of the involucre short and very glandular; ray-achenes with a minute crown of short scales; disk-achenes with nearly erect plumose bristles as long as the achene.—(*Hemizonia plumosa* Gray.)

Antioch and Stockton.

2. *B. laxa* Greene. Three to 6 ft. high; heads larger, borne singly at the ends of the branches, 20 to 25-flowered; pappus of disk-achenes short and spreading, less plumose than in the preceding, only $\frac{1}{2}$ as long as the achene; ray-achenes similar.—(*Hemizonia plumosa* var. *subplumosa* Gray.)

Stockton to Stanislaus Co. Perhaps not specifically distinct from the preceding.

52. BLEPHARIPAPPUS Hook. LAYIA.

Vernal annuals with alternate leaves (or the lowest opposite in one species) and usually showy heads of flowers terminating the branches. Disk-corollas yellow. Ray-flowers 8 to 20, yellow, white, or yellow tipped with white. Bracts herbaceous, the thin margins at base enfolding the achene and usually deciduous with it. Receptacle broad and flat, with a row of thin bracts between ray- and disk-flowers, and sometimes with additional ones among the disk-flowers. Ray-achenes flattened, without pappus, almost always glabrous. Disk-achenes commonly pubescent, with a pappus of 5 to 20 paleæ or bristles or rarely none. (Greek *blepharis*, eye-lash, and *pappos*, the modified calyx being likened to the fringe of hairs on an eye-lid.)

We have here in this West American genus series of forms simulating each other exactly in habit, foliage, and heads of flowers, differing only in technical character of the pappus or color of the ray. This situation is paralleled in *Cryptanthus* of the *Borraginaceæ* and in other genera. The acquisition of more abundant material and of field notes will be valuable aids to a more satisfying study of the forms here tentatively listed.

A. Pappus-bristles hairy or long-plumose below.

Bracts of the involucre hirsute or hispid (the basal margin where folded around the achene not denticulate-ciliate).

Inner hairs of pappus-bristles woolly and interlaced.

Rays white and

Inconspicuous; leaves all entire. 1. *B. hispidus*.

Showy; lower leaves incised or toothed. 2. *B. glandulosus*.

Rays yellow (rarely white-edged). 3. *B. elegans*.

Hairs of pappus-bristles straight (no woolly inner ones).

Rays wholly white.

Rays conspicuous, much exceeding the disk; interior plains: var. *heterotrichus* of 2. *B. glandulosus*.

Rays inconspicuous, scarcely exceeding the disk; seashore 4. *B. carnosus*.

Rays yellow, or yellow and white (herbage hispid, the stems brown-spotted at the base of the bristles).

Rays short (1 to 2 or 3 lines long) 5. *B. hieracioides*.

Rays showy (5 lines long or more) and

Yellow; pappus-bristles twice as long as the soft basal hairs 6. *B. gaillardiioides*.

White, yellow below the middle; pappus-bristles scarcely exceeding the soft hairs. 7. *B. nemorosus*.

B. Pappus consisting of naked bristles.

Bracts of involucre denticulate-ciliate on the margin at base; rays yellow, white-tipped 8. *B. platyglossus*.

C. Pappus, when present, consisting of flattened awns or paleæ instead of bristles.

Bracts of the involucre denticulate or ciliate on the basal margins where folded around the achene.

Heads erect; rays yellow, white or whitish at summit.

Achenes of both disk and ray glabrous; pappus none 9. *B. chrysanthemoides*.

Achenes of disk pubescent or hairy; pappus present.

Leaves ciliate; pappus-paleæ unequal 10. *B. Douglasii*.

Leaves not ciliate; pappus-paleæ about equal 11. *B. Fremonti*.

Heads nodding in bud and fruit; rays yellow 12. *B. nutans*.

1. **B. hispidus** Greene. Diffusely branched from the base, 1 ft. high or less; herbage densely hispidulous throughout; leaves narrow, all entire; heads small; rays white, inconspicuous; pappus bristles 10, slender, bearing copious short interlaced hairs.

Mt. Diablo and Kern Co., acc. to Greene. Possibly no more than a variety of the next.

2. **B. glandulosus** Hook. Commonly branching from the base, 8 to 12 or 14 in. high; leaves and stems (particularly near the heads) with scattered or abundant stipitate dark glands; leaves lanceolate or linear, the lower pinnatifid or toothed, the upper entire; involucre $4\frac{1}{2}$ lines broad; rays 8 to 10, pure white, 6 or 7 lines long; pappus bright white, the bristles 10 to 12, with straight hairs towards the base outside and woolly tangled hairs inside; achenes $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long.—(*Layia glandulosa* H. & A.)

Antioch; Southern California. Apr.

Var. **heterotrichus** (*Layia heterotricha* H. & A.). Often rough-hispid; rays 10 to 18; inner woolly hairs of pappus wanting.—Sandy fields: Lake Co. (acc. to Greene); San Joaquin Valley.

3. **B. elegans** (Nutt.) Greene. Simple or diffuse, 8 to 11 in. high; herbage short-hispid, the stems often brown-dotted; stipitate glands small and scattered; leaves linear, the lower pinnately toothed or parted; rays yellow, 6 to 8 lines long, sometimes white-edged; pappus white, the villous hairs copious but much shorter than the awn-like bristles.—(*Layia elegans* T. & G.)

Ukiah, acc. to Gray; mountain summits east of Calistoga; Southern California.

4. **B. carnosus** (T. & G.) Greene. BEACH LAYIA. Five to 9 in. high, diffusely branched from the base, somewhat pubescent, scarcely at all glandular; leaves succulent, spatulate to linear-oblong,

rarely toothed, about $\frac{1}{2}$ in. long; pappus-bristles 23 to 28, sparsely plumose with straight soft hairs; disk-achenes thickly covered with short hairs.

Seabeach sands from Humboldt Co. to Monterey and southward. Ray-achenes pubescent, acc. to Gray; glabrous in Point Reyes specimens collected by Parry.

5. **B. hieracioides** (DC.) Greene. Coarse erect plant, 2 to 3 ft. high; stem mostly simple below and branching above, hispid with hairs arising from dark spots; lower leaves oblong, 2 to 4 in. long, 3 to 9 lines wide, laciniate-dentate, usually somewhat narrowed at base; upper leaves broadest at the sessile base, the teeth fewer and mostly towards the apex; heads $\frac{1}{2}$ in. broad or rather less; rays yellow, short, little exceeding the disk; pappus-bristles about 15.—(*Layia hieracioides* H. & A.)

Oakland Hills, on wooded slopes.

6. **B. gaillardiioides** (H. & A.) Greene. Rather freely branching, 8 in. high or more, hispid, the stems dark-dotted; leaves more or less laciniate-pinnatifid, or the upper entire; heads larger than in *B. hieracioides*; rays orange-yellow, 5 to 9 lines long; pappus dull white or rusty, the bristles 15 to 20.

Mendocino Co. to the upper San Joaquin Valley.

7. **B. nemorosus** Greene. Slender, usually sparingly branched above, 1 to 2 ft. high, hispidulous; leaves narrowly or broadly linear, entire or sparingly dentate; heads the size of the preceding; rays white, pale yellow below the middle; pappus-bristles short, little or not at all surpassing the abundant soft brown hairs.

Mt. Tamalpais; Oakland Hills; Mt. Diablo. May-June.

8. **B. platyglossus** (Gray) Greene. TIDY TIPS. Stem simple or more commonly branching below, erect or sometimes diffuse, 9 to 16 in. high; herbage short-hirsute and stipitate-glandular; leaves linear and nearly all entire or the lower commonly pinnatifid into short linear or oblong lobes; peduncles turbinate-thickened beneath the head; involucre bracts linear, denticulate-ciliate on the lower half; rays 13, 5 to 6 lines long, sulphur-yellow, the tips white; disk-achenes somewhat flattened, $1\frac{1}{2}$ lines long, densely clothed with upwardly pointing silky hairs; pappus-bristles 15 to 20, nearly as long as the corolla.—(*Layia platyglossa* Gray.)

Valleys and plains, common in the Coast Ranges and in the Sacramento and San Joaquin Valleys. Apr.-May.

B. PENTACHÆTUS (Gray) Greene. The only other species with naked bristles; rays golden yellow; bristles 5, sometimes fewer.—Sierra Foothills.

9. **B. chrysanthemoides** (DC.) Greene. Habit and aspect of *B. platyglossus* or of *B. Douglasii*; flowers and heads the same; achenes entirely glabrous, broader, without a disk at summit, the corolla covering the top of the ovary; pappus none.—(*Layia chrysanthemoides* Gray.)

Common about San Francisco Bay.

10. **B. Douglasii** (H. & A.) Greene. Comparatively glabrous, the stems for the most part puberulent only above and the leaves merely finely ciliate; lower leaves pinnately parted or lobed, upper entire; achenes villous-pubescent or partly glabrate; chaffy bracts to most of the disk-flowers as also in the next; pappus of about 10 to 18 unequal and rigid subulate awns, which are somewhat scabrous or slightly hirsute near the dilated base, the marginal ones rather shorter than the corolla, the smaller hardly half as long.—(*Layia calliglossa* Gray.)

Common around San Francisco Bay.

Var. **oligochætus** (Gray). Leaves less lobed; pappus of only 2 slender (and often short) marginal awns or with some intervening rudiments.—Conn Valley, Napa Co.; Santa Rosa. May.

11. **B. Fremonti** (T. & G.) Greene. About 1 ft. high, minutely pubescent; leaves mostly pinnately parted, not ciliate; pappus-paleæ ovate- to oblong-lanceolate, tapering into a subulate awn, nearly equaling the corolla, the margin entire, accompanied by some long-villous free hairs.—(*Layia Fremonti* Gray.)

Upper Sacramento Valley southward to the San Joaquin.

12. **B. nutans** Greene. Low, 5 to 7 in. high, the branches slender and divergent; herbage hirsute, especially the leaves, the stems reddish brown; leaves linear, all entire, the lower pairs opposite; peduncles somewhat stipitate-glandular; heads erect in flower, nodding in bud and fruit; rays 5 to 7, yellow, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; achenes $1\frac{1}{2}$ lines long, hispidulous; pappus-bristles narrowly lanceolate, acuminate, 8 to 10, unequal, with barbellate margins.—(*Callichroa nutans* Greene.)

Higher mountain slopes on the east side of Napa Valley; Hood's Peak, Sonoma Co. May. Excellent species.

53. LAGOPHYLLA Nutt.

Soft-villous or hirsute annuals with rigid and brittle stems, in ours usually becoming naked below by the early falling of the lower leaves. Leaves alternate or the lower opposite, mostly entire. Flowers pale yellow. Heads small, subtended by foliaceous bracts. Bracts of the involucre 5, thin-herbaceous; flat on the back, with margins at base infolded and completely enclosing an obcompressed achene, with which it is deciduous. Receptacle small and flat, bearing about 5 perfect disk-flowers, these surrounded by a single row of distinct chaffy bracts. Rays cuneate, palmately 3-cleft. Ray-achenes obcompressed, obovate-oblong, smooth, nearly straight, pointless; disk-achenes slender, sterile. Pappus none. Bracts and glabrous achenes all deciduous at maturity. (Greek lagos, a hare, and phullon, leaf, the upper leaves sometimes copiously villous on the margin.)

1. **L. ramosissima** Nutt. Stem simple, at length paniculately very much branched; leaves (especially the upper) silky-hirsute with soft hairs, the short ones subtending the heads densely villous-ciliate;

lower leaves oblanceolate or linear-lanceolate, often narrowed at base to a slender petiole, 1 to 2½ in. long, often becoming concave or involute when dry; heads almost sessile, crowded on the leafy branchlets; rays barely exserted, pale yellow; fertile achenes carinately 1-nerved down the inner face.

Common on dry hills and plains in the Coast Ranges (Solano Co., Napa Valley, Healdsburg, Alameda Co.), and Sierra Foothills.

Var. *congesta* (L. *congesta* Greene). Robust, nearly simple, with short branches, 1 to 1½ ft. high or much branched and nearly 3 ft. high; heads larger, in thick glomerules.—North Coast Ranges: Mt. Tamalpais, collected "by that most diligent gatherer of rare Californian plants, Mrs. Kate Curran," *Greene*; Pleasant Valley, Solano Co.; Lake Co.

54. HOLOZONIA H. & A.

Perennial by creeping rootstocks. Stems slender and branches almost filiform. Leaves opposite or the upper alternate. Heads solitary, on slender or filiform peduncles, without leafy bracts. Flowers white or rose-tinged; rays 5. Bracts of the involucre 5, completely enclosing and deciduous with the obcompressed ray-achenes. Bracts of the receptacle 9 to 12, connate into a cup surrounding the few disk-flowers. Ray-achenes crowned with a small saucer-shaped pappus; disk-achenes with a pappus of 2 slender deciduous paleæ. (Greek *holos*, whole, and *zonias*, zone, the bracts completely enclosing the ray-achenes.)

1. *H. filipes* (H. & A.) Greene. Stems often paniculately branching, 1½ to 2¾ ft. high; leaves linear, canescent or villous, those of the filiform branchlets oblong with marginal short-stipitate glands; involucre loosely villous; bracts of receptacle chaffy.—(*Lagophylla filipes* Gray.)

North Coast Ranges: Mt. Tamalpais; Sonoma Co.; Napa Soda Springs; Howell Mt. Sierra Nevada: Mariposa Co.; Calaveras Co.; El Dorado Co. July–Aug. Lowest leaves linear or somewhat lanceolate, commonly with 1 to 3 small teeth on each side, 1 to 4 in. long; upper entire, glabrate in age.

55. ACHYRACHÆNA Schauer.

Soft-pubescent annual with narrow leaves, the lower opposite. Involucre oblong-campanulate, its bracts lanceolate, herbaceous, each enfolding a ray-achene. Bracts of the receptacle membranous, in a single outer series. Receptacle low-convex, naked. Flowers reddish brown. Ray-flowers 5 to 8, little exceeding the disk, their ligules short and broad, palmately 3-cleft. Achenes linear-clavate, all the ribs or the alternate scabrous. Disk-achenes with a pappus of about 10 silvery scales, the outer as long as the achene, the inner nearly twice as long. (Greek *achuron*, chaff, and Latin *achænium*, an achene, on account of the very chaffy pappus borne on the fruit.)

1. *A. mollis* Schauer. Erect, simple or branching, 9 to 18 in.

high, pilose-pubescent; branches more or less peduncle-like, each 1-headed; leaves linear, entire or serrulate, 5 in. long or less; heads in flower $\frac{3}{4}$ in. high, in fruit expanding and forming a globose cluster $1\frac{1}{2}$ in. broad; paleæ of the achenes also expanding or diverging rotately.

Abundant in adobe soil of the plains and valleys: Sierra Foothills (Amador Co., Knights Ferry); San Joaquin Valley; Sacramento Valley; North Coast Ranges; South Coast Ranges (Contra Costa Co., Berkeley, Livermore, San Francisco, Santa Clara Valley and southward to Arroyo Grande and Southern California). Readily recognized in fruit by its expanded heads of black achenes with their silvery pappus. Mr. Geo. B. Grant sends us specimens from Sunol Glen in which the ray-flowers are entirely absent.

TRIBE 7. *Heliantheæ*. SUNFLOWER TRIBE.

56. *ECLIPTA* L.

Low weak riparian herb with opposite leaves and white flowers. Heads solitary in the upper axils, the peduncles long or very short. Involucre broad, its bracts herbaceous and in about 2 series. Bracts of the receptacle awn-like. Rays short. Disk-flowers perfect and fertile, their corollas 4-toothed. Achenes thick, those of the ray 3-sided, those of the disk compressed. Pappus none or of a few short teeth. (Greek *ekleipta*, wanting, on account of the absence of the pappus.)

1. *E. alba* Hassk. *ECLIPTA*. Decumbent, 1 or 2 ft. high; leaves lanceolate or oblong-lanceolate, sparingly serrulate, sessile or the lower short-petioled, roughish with a strigose pubescence; disk-achenes at length corky-margined.

Shores of islands in the lower Sacramento River. Sept.

57. *BALSAMORRHIZA* Hook. BALSAM ROOT.

Low perennials with thick terebinthine-scented roots, crowned by a tuft of radical leaves and several naked or few-leaved stems, bearing solitary heads of yellow flowers. Outer bracts of the broad involucre foliaceous. Ligules with a distinct tube. Achenes destitute of pappus, those of the disk 4-sided. (Greek *balsamon*, balsam, and *rhiza*, root.)

1. *B. Hookeri* Nutt. Herbage canescent with fine short hairs; leaves 7 to 10 in. long, pinnately divided, the divisions serrate or again pinnately divided; scapes equaling or exceeding the leaves, bearing solitary heads; bracts of the involucre oblong-lanceolate; bracts of the receptacle linear, acuminate, the outer with green tips; heads 2 to $2\frac{1}{2}$ in. broad, including the ample rays.

A rare plant of the hilly districts from the Oakland Hills northward through the Coast Ranges to Tehama Co. May.

Two other species of the Sierra Nevada have entire or merely serrate leaves, the radical ones cordate: *B. DELTOIDEA* Nutt. Flowering stems with small lanceolate leaves. *B. BOLANDERI* Gray. Flowering stems with 2 or 3 large subcordate leaves.

58. **WYETHIA** Nutt.

Perennial herbs. Root very stout, crowned by a short caudex which bears a tuft of ample leaves and several simple 1-headed stems. Leaves mostly entire, the cauline mostly few and smaller. Heads large. Involucre hemispherical or campanulate, its bracts in 2 or 3 series, the outermost often foliaceous and much enlarged, the innermost small and bract-like. Receptacle flat or nearly so, its bracts rigid, linear or lanceolate, either flattish or partially folded around the achenes. Flowers yellow, both ray and disk fertile, the latter perfect; ligule of ray-corollas elongated and very conspicuous. Branches of the style in perfect flowers produced into subulate-filiform hispid appendages. Achene prismatic-quadrangular. Pappus firm and persistent, consisting of a crown of unequal scales, or with rigid awns at the angles. (In honor of Capt. Nath. J. Wyeth, with whom Nuttall crossed the continent in the early part of the 19th Century.

Leaves elongated-lanceolate, the cauline sessile; outer bracts of the involucre not foliaceous, little or not at all surpassing the disk.

1. *W. angustifolia*.

Leaves elongated-oblong or ovate, the cauline short-petioled; involucre foliaceous, the outer bracts spreading and commonly much surpassing the disk.

Herbage minutely or even floccose tomentose. 2. *W. helenioides*.

Herbage perfectly glabrous, glandular-pubescent and roughish.

3. *W. glabra*.

1. ***W. angustifolia*** Nutt. Stems 1 to 2 ft. high, hirsute; herbage green; leaves elongated-lanceolate, acuminate at both ends, occasionally serrulate, the radical and lower ones $\frac{1}{2}$ to 1 ft. long, the upper sessile and smaller; heads naked, *i. e.*, not leafy at the base, the bracts of the involucre numerous, broadly linear or lanceolate, loose, ciliate with villous or hirsute hairs; achenes minutely pubescent at summit, 3 lines long, bearing 1 or 2 (or those of the ray 3 or 4) stout minutely hirsute awns, with some very short intervening chaffy scales, all more or less united at base, rarely awnless.

Common on the plains and low hills: Monterey Co.; San Mateo Co.; San Francisco Co.; Oakland Hills; Mt. Diablo; Solano Co. and northward to Shasta Co.

2. ***W. helenioides*** Nutt. One to 2 ft. high, soft-tomentose, almost glabrous in age; radical leaves 1 to 2 ft. long, 4 to 6 in. wide, acute at base and apex, often undulate, long-petioled; cauline leaves much smaller, more commonly oblong-ovate; heads 3 in. broad, including rays, mostly leafy at base; outer scales of the involucre ovate-lanceolate or ovate, sometimes toothed; pappus and upper portion of achenes slightly pubescent, at least when young.

Common in the Coast Range hills: San Luis Obispo Co.; Oakland Hills; Antioch; Vaca Mountains, etc. Apr.-May.

3. ***W. glabra*** Gray. MULE'S EARS. Green and glabrous throughout, minutely resinous-glandular or viscid, and scabrous, at least when dry; leaves as in the preceding, or broader and obtuse, sometimes toothed, rarely undulate; achenes and pappus glabrous.

Marin Co.; San Mateo; Antioch; San Joaquin Valley. Less common than no. 2 and scarcely differing except in surface character of the leaves and stems.

59. *HELIANTHUS* L. SUNFLOWER.

Stout coarse herbs with petioled simple leaves, yellow mostly entire rays and brownish or purplish disk. Leaves (all but the lower or lowest) alternate. Heads large, solitary on the ends of the branches or in terminal corymbs. Bracts of the involucre imbricated. Receptacle flat or convex, its bracts persistent and embracing the 4-sided achenes. Pappus of pointed paleæ borne at the angle of the achene, often with very small intervening scales, all caducous. (Greek helios, sun, and anthos, flower, the heads turning toward the sun.)

Annuals; heads terminal on the branches.

Bracts of the involucre ovate 1. *H. annuus*.

Bracts of the involucre lanceolate or oblong-lanceolate.

Stems scabrous; awn of the chaffy bract equaling the disk-flowers . . .

2. *H. Bolanderi*.

Stems often hirsute, particularly near the heads; awn of the chaffy bract surpassing the disk-flowers 3. *H. exilis*.

Perennial; heads corymbose-paniculate at the summit of the simple stem; bracts with long spreading tail-like tips 4. *H. Californicus*.

1. *H. annuus* L. COMMON SUNFLOWER. Stems erect and simple or more or less branching, 2 to 5 ft. high; herbage rough-hispid; leaves deltoid-ovate, serrate, the uppermost narrow and often entire; bracts of the involucre ovate, slenderly acuminate; disk 1 in. in diameter, more or less; rays 1 to 1½ in. long.

Plains of the San Joaquin and Sacramento Valley, first appearing in low places along country roads. July–Sept.

2. *H. Bolanderi* Gray. Stems erect or diffusely branching, 1 to 3 ft. high, scabrous-hispid; leaves ovate- to oblong-lanceolate, serrate or entire; rays 8 lines long, toothed at apex; disk purple, 9 or 10 lines broad; bracts of the involucre hirsute, oblong-lanceolate, attenuate or acuminate; bracts of receptacle chaffy, 3-toothed, the middle tooth much longer and awn-like.

Abundant in low grain fields of the Sacramento Valley, thence westward to the coast. Aug.–Sept. First collected at Bodega by Hinds, botanist of the British exploring ship Sulphur.

3. *H. exilis* Gray. Slender, often unbranched, 1 to 2 ft. high; leaves ovate-lanceolate to linear-lanceolate; peduncles often hirsute-villous beneath the heads; bracts of the involucre lanceolate, hairy on the lower half; rays 6 or 7 lines long; awn-tip of the chaffy bract surpassing the disk-flowers.

Common in valleys about Clear Lake (where first collected by Bolander); Sacramento Valley plains (acc. to Greene). Aug. Perhaps better a variety of the preceding.

4. *H. Californicus* DC. Stems from somewhat tuber-like roots, 4 to 11 ft. high; leaves from oblong to narrowly lanceolate, some of the lower ovate, minutely hispidulous, 5 to 9 in. long including the petiole, the lower opposite, the upper alternate, the larger 3-ribbed;

heads $\frac{3}{4}$ in. high, in a terminal corymbose panicle; chaffy bracts of the receptacle obtuse; bracts of the involucre lanceolate, tapering into long spreading tail-like tips; rays about 15 to 20, 1 in. long or more; achenes flattish, glabrous; pappus of 2 or 3 lanceolate chaffy paleæ.

Stream beds and banks: Coast Ranges (Howell Mountain, Vaca Valley, Suisun Marshes, Alameda, San Jose); Sierra Nevada. Sept.

60. *HELIANTHELLA* T. & G.

Low nearly acaulescent perennial herbs. Leaves entire, chiefly radical, the cauline mostly opposite. Flowers yellow. Heads large, solitary, long-peduncled. Involucre hemispherical, its bracts linear-lanceolate and loosely imbricated, the outer mostly foliaceous and attenuate-acuminate, the innermost shorter and chaff-like. Receptacle flat or convex, its bracts embracing the achenes. Achenes commonly compressed, with thin or margined edges and emarginate summit. Pappus an awn or chaffy tooth from each margin, and usually with very small intermediate scales. (Diminutive of *Helianthus*.)

1. *H. Californica* Gray. Stems slender, 1 to 2 ft. high, occasionally branched; herbage minutely scabrous; leaves ovate to oblong-lanceolate, tapering into petioles; rays little or not at all longer than the involucre; bracts of receptacle obtuse; achenes obovate, smooth, glabrous and narrowly margined, minutely ciliate when young only near the summit; pappus of two short triangular or subulate teeth, and a crown of minute scales nearly obsolete at maturity.

Higher mountain ridges: Coast Ranges (Contra Costa, Marin, Napa and Solano Cos. and northward to Mt. Shasta); Sierra Nevada. May.

H. CASTANEA Greene. Stems less than 1 ft. high, hispid with short spreading hairs; achenes cuneate-obovate, not strongly compressed or thin-edged, dull black at base, chestnut-brown above the middle, the apical notch short and deep.—Mt. Diablo. Fruiting heads not seen by us.

61. *BIDENS* L. BUR MARIGOLD.

Herbs (ours annuals), with opposite leaves and yellow flowers. Heads many-flowered; rays 3 to 9, neutral. Involucre double, the outer bracts linear-oblong, foliaceous, the inner elliptic to ovate, membranous. Achenes somewhat flattened parallel with the scales of the involucre or slender and 4-sided, those of the disk crowned with 2, 3, or 4 rigid persistent retrorsely barbed awns. (Latin *bidens*, 2-toothed.)

Leaves simple; rays 3 to 9, conspicuous; achenes downwardly barbed on the margin; rays showy.

Outer involucre little or not at all surpassing the disk; rays very showy, golden yellow 1. *B. chrysanthemoides*.

Outer involucre foliaceous and surpassing the disk; rays usually light yellow, smaller 2. *B. cernua*.

Leaves pinnately 3 to 5-divided; rays 1 to 5, inconspicuous; achenes upwardly barbed 3. *B. frondosa*.

1. **B. chrysanthemoides** Michx. BUR MARIGOLD. Often decumbent at base, 1 to 3 or even 4 ft. high, glabrous; leaves lanceolate, usually tapering at the base, evenly serrate, more or less connate at base, 7 in. long or less; outer involucre rather longer than the inner, much surpassed by the oval golden brown rays, these 1 in. long or more; disk brownish; heads in fruit erect, seldom slightly nodding; achenes flat or flattish, cuneate, distinctly carinate on the sides and retrorsely hispid on the marginal angles; awns 2 or 3, retrorsely barbed.—(*B. lævis* B.S.P.)

Low wet ground: Alvarado marshes; lower Sacramento River. Sept.—Oct.

Var. **Nashii** (B. Nashii Small). Leaves minutely serrate or almost entire, somewhat fleshy, some of the upper often very broad at base but rarely clasping; achenes slightly contracted at summit.—San Francisco, acc. to Wiegand.

2. **B. cernua** L. SMALLER BUR MARIGOLD. Stems 8 to 20 in. high, glabrous or setulose-hispid; leaves oblong-lanceolate, rather irregularly serrate, mostly not connate; outer involucre bracts exceeding the disk, spreading, foliaceous; rays 6 to 10, mostly light yellow, 3 to 6 lines long, sometimes none; heads strongly nodding in fruit; achenes 4-angled and usually 4-awned.

Less common than the last.

3. **B. frondosa** L. BEGGAR-TICKS. Erect, 3 or 4 ft. high, glabrous or slightly pubescent; leaves 3 to 5-divided, the divisions or leaflets petiolulate, lanceolate, coarsely toothed; rays 1 to 5, inconspicuous, usually shorter than the greenish yellow disk; achenes very flat, cuneate-oblong, 4 to 5 lines long, dentate on the margin with barbs upwardly pointed (except at the summit), 2-awned; heads erect in fruit, surpassed by the outer foliaceous bracts.

Lower Sacramento River; very common. Sept.

62. LEPTOSYNE DC.

Perennials with thickened fleshy stems or ours annuals and almost acaulescent. Leaves dissected into narrowly linear or filiform lobes. Flowers yellow, in showy heads on long naked peduncles. Rays several or numerous, oblong or obovate, 3-toothed at apex. Involucre double; bracts of the inner series 8 to 12, erect, membranous; bracts of the outer series 5 to 8, narrow, loose and foliaceous. Receptacle nearly flat, its bracts thin, scarious, linear or lanceolate, falling with the fruit. Achenes flattened, more or less wing-margined, alike in disk and ray. Pappus a minute ring or cup, or consisting of linear paleæ. (Greek leptosune, slenderness.)

Achenes alike in ray and disk; pappus cup-shaped; corolla-tube without a hairy ring.

1. *L. Stillmani*.
Achenes of 2 different shapes, those of the disk long-villous; pappus paleaceous; corolla-tube with a hairy ring towards the summit.

2. *L. calliopsidea*.

1. **L. Stillmani** Gray. Nine to 12 in. high, stoutish, leafy below and with manifest branches; leaf-divisions 1 line broad; involucre

commonly somewhat hairy at base; disk-corollas beardless; achenes surrounded by a thick and corky rugose wing, smooth and glabrous on the back, the inner face sparsely papillose, or with a row of tubercles on the median ridge; pappus-cup either entire or 2-lobed.

Sacramento Valley.

2. *L. calliopsidea* Gray. Leafy, with less scape-like peduncles, 1 to 2 ft. high; bracts of the outer series of the involucre broadly ovate, a little shorter than the narrowly ovate inner ones, commonly 1 in. long, $\frac{3}{4}$ in. wide and 15 to 20-nerved; ring of the disk-corolla pubescent; achenes of the ray- and outer disk-flowers oval, flat and glabrous; disk-achenes cuneate-oblong, long-villous on the margins and inner face; pappus-paleæ 2, linear.—(*Pugiopappus calliopsideus* Gray.)

Moist hillsides in the South Coast Ranges.

TRIBE 8. Ambrosiææ. RAGWEED TRIBE.

63. IVA L.

Ours coarse herbs with thickish alternate (or the lower opposite) leaves and small nodding heads of greenish white flowers. Involucre hemispherical, its bracts few and rounded. Receptacle with chaff-like linear or spatulate bracts. Marginal flowers of the head pistillate, 1 to 5 in number, their corollas tubular or none. Disk-flowers perfect, with 5-lobed funnelform corolla and undivided style. Anthers almost distinct. Achenes flattened, glabrous. Pappus none. (Said to be named after Ajuga Iva of the Mint Family, on account of the similar odor.)

1. *I. axillaris* Pursh. POVERTY WEED. Stems many, erect from a decumbent or prostrate base, 6 to 10 in. high; leaves narrowly obovate, varying to lanceolate or linear, entire, sessile; heads solitary in the axils, short-peduncled, surpassed by the leaves; bracts of the involucre united into a lobed or merely toothed cup.

Alkaline plains and borders of salt marshes: Sacramento Valley; San Joaquin Valley; Livermore Valley and southward. Aug.-Sept.

64. AMBROSIA L. RAGWEED.

Ours a coarse homely but aromatic perennial herb with alternate pinnatifid leaves and inconspicuous greenish unisexual flowers. Heads of staminate flowers disposed in erect ament-like racemes:—involucres broadly turbinate; receptacle of at least the outer flowers with slender bracts; corollas funnelform, 5-lobed. Heads of pistillate flowers in the axils of the upper leaves at the base of the staminate racemes:—involucres oblong or turbinate, closed, containing but a single flower; corolla none; pappus none; fruit an achene-like bur which is beaked or pointed and is armed near the top with a single row of prickles. (Ancient Greek name.)

1. *A. psilostachya* DC. WESTERN RAGWEED. Stems simple, erect, 1, 2 or more ft. high, from slender running rootstocks; herbage

pubescent and somewhat strigose; leaves once or the lower twice pinnatifid; fruit an obovoid turgid bur, mostly solitary in the axils, bearing 4 protuberances or sometimes unarmed.

Uncultivated lands in the Sacramento Valley and southward; common about San Francisco Bay. Sept.-Oct.

65. **FRANSERIA** Cav.

Branching herbs, ours perennial, sometimes woody at the base. Leaves chiefly alternate. Habit, flowers and inflorescence as in Ambrosia. Involucre of the pistillate heads closed, 1 to 4-celled, 1 to 4-beaked or pointed, armed with several rows of prickles and in fruit becoming a bur. (Named for Ant. Franser, Spanish botanist.)

Leaves twice or thrice pinnatifid or pinnately parted . . . 1. *F. bipinnatifida*.
Leaves (at least the upper) undivided and merely serrate . . . 2. *F. Chamissonis*.

1. ***F. bipinnatifida*** Nutt. Herbaceous; stems procumbent, 2 or 3 ft. long, somewhat hirsute; leaves twice or thrice pinnately parted into oblong lobes, canescent or almost silky; spikes dense; bur narrowly ovate, armed with thick somewhat flattened spines, some of which are curved at the tip.

Common on sandy seabeaches along the coast, and also at Alameda and West Berkeley. Aug.-Oct.

2. ***F. Chamissonis*** Less. Habit of the preceding; leaves narrowly ovate or obovate, with cuneate base, serrate, or the lower lacinate or incised; bur thicker, sparsely hirsute, the spines broader and channeled.

Seabeaches along the coast; less common.

66. **XANTHIUM** L.

Coarse (by some called vile) annual weeds with widely branching and very stout stems. Leaves alternate, toothed or lobed, petioled. Heads unisexual, composed of greenish flowers. Staminate heads subglobose, in a terminal cluster:—involucre of several distinct narrow bracts in a single row; receptacle cylindrical; flowers many, separated by the bracts of the receptacle; corolla tubular. Pistillate heads axillary, below the staminate:—involucre closed, forming in fruit an ovoid or oblong indurated bur covered all over with hooked prickles, 1 or 2-beaked, 2-celled, each cell containing 1 flower; corolla none; pappus none; style 2-cleft, its branches exerted through the beaks. (Greek xanthion, yellow, from its yielding a hair-dye of that color.)

Leaves deltoid-ovate; stems not spiny 1. *X. Canadense*.
Leaves lanceolate; stems bearing spines by the sides of the leaves. 2. *X. spinosum*.

1. ***X. Canadense*** Mill. **COCKLE BUR.** Stems about 2 ft. high, not prickly; leaves deltoid-ovate or somewhat cordate, irregularly serrate, or somewhat incised, often distinctly 3-lobed, rough, hispidulous and green both sides, 3 to 4 in. long, on petioles nearly as long; bur $\frac{3}{4}$ to 1 in. long, thick, pubescent or glandular between and on the

lower part of the crowded prickles and bearing at apex a pair of strong beaks hooked or incurved at tip.

Naturalized weed, native of the Eastern U. S., exceedingly abundant in low lands, often covering hundreds or thousands of acres. Flowering in summer and fruiting in autumn.

2. **X. spinosum** L. SPINY CLOTHUR. Stems puberulent, much branched; leaves lanceolate or ovate-lanceolate, acute or acuminate, 2 or 3-lobed or -cut, or the upper entire, narrowed at base into a short petiole, green above, white-pubescent beneath, 2 to 5 in. long; by the sides of the leaves are borne yellowish 3-pronged spines 1 in. long; corolla pubescent with short rusty hairs; bur narrowly oblong, $\frac{1}{2}$ in. long, sparsely prickly; beaks inconspicuous, only one spinose.

Naturalized European weed, a common summer tenant of barnyards and neglected fields: Sacramento, San Joaquin, and Coast Range valleys and Sierra Foothills.

TRIBE 9. Inuleæ. EVERLASTING TRIBE.

67. MICROPUS L.

Small floccose-woolly annuals with entire leaves and scattered several-flowered discoid heads. Bracts of the involucre open, scarious, surrounding the flower-bearing bracts of the receptacle. Bracts of the receptacle conduplicate, tipped with a scarious appendage and almost concealed by the clothing of long loose wool, each one enclosing a pistillate flower; sterile flowers in the center mostly naked. Achenes gibbous, the corolla and style borne laterally, without pappus, remaining enclosed in the cucullate bracts which finally fall away from the receptacle. (Greek micros, small, and pous, foot, in allusion to the soft-woolly heads.)

Beak-like tip to the fruiting bract largely scarious, erect, short

Beak of the fruiting bract wholly hyaline, in anthesis as long as the body.

1. *M. Californicus*.

2. *M. amphibolus*.

1. **M. Californicus** F. & M. Slender, erect, 4 to 8 in. high, commonly branched only at the very summit; leaves linear-oblong, acuminate; receptacle low, with several scale-like processes; fruit-bearing bracts 4 to 6, at length indurated, the surrounding bracts of the involucre commonly 5; these orbicular or ovate, scarious, with a green spot in the center; staminate flowers about 3, the corolla filiform, but expanding somewhat toward the throat.

Very common on low hills or valley land through the Coast Ranges and Sacramento and San Joaquin Valleys to Southern California. Last of Apr.—May.

2. **M. amphibolus** Gray. Resembling the preceding but the fruiting bracts 9 or 10 and comparatively thin and soft; receptacle elevated or oblong; staminate flowers subtended by linear thin chaff-like bracts and with a pappus of few bristles.

Walnut Creek, *Brewer*, no. 1015, 1862; too little known species.

68. **STYLOCLINE** Nutt.

Low floccose-woolly annuals with entire leaves and terminal discoid heads in small clusters. Pistillate flowers with filiform corolla, their bracts ovate, boat-shaped, borne on a slender column-like receptacle, with erect hyaline tip and the conduplicate body loosely enclosing the achene; pappus none. Sterile flowers few in the center, their bracts plane or barely concave and their pappus caducous or none. (Greek stulos, a column, and kline, a bed, on account of the form of the receptacle.)

Bracts of the sterile flowers inconspicuous, oblanceolate, acute; pappus present 1. *S. gnaphalioides*.
Bracts about sterile flowers ovate-lanceolate, tapering into a conspicuous rigid hooked cusp; pappus none 2. *S. filaginea*.

1. ***S. gnaphalioides*** Nutt. Loosely white-woolly, diffusely branched, the stems 4 to 9 in. long; leaves broadly linear or the upper oblong, obtuse, barely 3 lines long; pistillate (or fertile) flowers numerous, their bracts ovate, nearly plane on the upper surface, a central portion at the base produced on the lower side into a sac enclosing the achene, this portion firm, the remainder hyaline; sterile flowers little shorter than their bracts, with rudimentary ovary and a pappus of few caducous bristles.

Stanislaus Co. to Monterey, doubtless within our limits. Sac woolly on lower side. Sterile flowers little shorter than their bracts.

2. ***S. filaginea*** Gray. Erect, branched from the base, 2 to 8 in. high, canescent with fine appressed wool which is later flocculent; cauline leaves narrowly linear ($\frac{1}{2}$ line wide), those involucrate to the heads much broader; fertile flowers 5 to 9, their bracts boat-shaped, firm except at the hyaline tip, smaller than the 5 empty bracts which surround the sterile flowers in the center; empty bracts somewhat coriaceous, tapering into a rigid incurved hooked cusp, persistent, and at length stellately spreading.

Mendocino Co. (first coll. by Bolander in Round Valley); Tehama Co., *Jepson*; Mt. St. Helena, *Greene*; southward to Southern California. Last of Apr.-May. Very suggestive in aspect of *Filago Gallica*.

69. **PSILOCARPHUS** Nutt.

Depressed or prostrate white-woolly annuals. Leaves opposite, entire, the uppermost involucrate around the small sessile globose heads, which are solitary in the forks or at the ends of the branches, or some clustered. Heads discoid. Bracts clothed with soft wool, crowded on the low receptacle and forming a globose head; each bract sac-like, half-obcordate or obovate in side view, hooded and rounded at the top with the apex introrse (turned downward and inward) and beaked by a hyaline appendage or scale. Flowers unisexual; pistillate flowers loosely enclosed in the sac-like bracts, with filiform corollas; staminate flowers few, occupying the center of the head and naked, *i. e.*, destitute of enclosing or other bracts. Achenes straight or slightly curved. Pappus none. (Greek psilos, bare, and karphos, chaff.)

Involucrate leaves obspatulate, 3 or 4 times longer than the head

1. *P. tenellus*.
Involucrate leaves oblong to lanceolate, 1 to 2 times as long as the head:
var. *brevissimus* of 2. *P. Oreganus*.

1. **P. tenellus** Nutt. Prostrate, the forking stems forming a dense mat 3 to 10 in. broad; leaves obspatulate, mucronate, 4 to 8 lines long; heads numerous, 2 lines wide; achene about $\frac{1}{3}$ line long, oblong or slightly broader toward the summit.

Valleys and low hills: Coast Ranges; Sacramento Valley; San Joaquin Valley(?). June.

2. **P. Oreganus** Nutt. var. *brevissimus*. Dwarfish, the stems prostrate, several to many from the base but mostly simple, 1 to 5 in. long; leaves oblong or some obspatulate, obtuse or merely acute, the involucre ones partly concealing the heads; heads comparatively few, 4 to 5 lines broad, more loosely woolly than in the preceding; staminate flowers about 7 or 8; achene cylindrical or slightly clavate, less than 1 line long.—(*P. brevissimus* Nutt.)

Dry beds of vernal pools: Elmira (Solano Co.) to Madrone (Santa Clara Co.). May–June.

70. **EVAX** Gærtn.

Dwarf rigid densely woolly annuals with entire leaves. Heads with disk-flowers only; pistillate flowers at base of slender columnar receptacle, the male flowers above, all subtended but not enclosed by bracts. Bracts of the pistillate flowers and bracts of the involucre becoming hardened, persistent.

Heads mostly scattered 1. *E. sparsiflora*.
Heads in terminal clusters 2. *E. caulescens*.

1. **E. sparsiflora**. Erect, 1 to 4 in. high, sometimes simple, commonly branching from the base, the heads in the axils, scattered along the branches or slightly glomerate at the ends of the branches; leaves spatulate, narrowed to a very slender petiole, 4 to 7 lines long; bracts of the receptacle woolly on back and rather densely long-hirsute at base, especially the upper; staminate flowers in center about 4.—(*Hesper-evax sparsiflora* Greene.)

Dry sterile soil: Healdsburg; Napa Valley.

2. **E. caulescens** Benth. Stem simple or with few long branches from the base, 2 to 8 in. high; heads all in a terminal hemispherical cluster, $\frac{3}{4}$ in. broad and surrounded by a whorl of many leaves; leaves spatulate-obovate, 1 to $1\frac{1}{2}$ in. long, the cauline similar but smaller.

Sacramento Valley.

Var. *humilis* (*Hesper-evax humilis* Greene. *Evax acaulis* Greene.) One or 2 in. high, the heads crowded on the short central stem or at the ends of the very short horizontal branches (none in the axils), the close clusters subtended by rosulately arranged leaves.—Antioch.

71. **FILAGO** L.

Low woolly annuals with entire leaves and small discoid heads in

capitate clusters. Receptacle hemispherical or conical, its summit or center bearing a cluster of fertile and sterile flowers with rather copious capillary pappus and surrounded by a series of scarious or chaff-like bracts. Base of receptacle bearing several pistillate flowers with filiform tubular corollas, the achenes of each enfolded in a concave or boat-shaped bract, and destitute of pappus: (Latin flum, a thread, in allusion to the cottony pubescence.)

Leaves oblong, tapering toward the base, abruptly acute at apex, the uppermost subtending and often not surpassing the heads. 1. *F. Californica*. Leaves subulate with broadish base, the uppermost subtending and conspicuously surpassing the heads 2. *F. Gallica*.

1. *F. Californica* Nutt. Erect, 4 to 9 (or sometimes 15) in. high, leafy throughout, the leaves $\frac{1}{4}$ to $\frac{3}{4}$ in. long; heads ovate, 2 lines long; receptacle convex, rough or somewhat bur-like; marginal bracts 8 to 10, very woolly, deeply boat-shaped and somewhat incurved at apex, spreading stellately at maturity; inner bracts oblong, plane or merely concave; marginal achenes smooth; central achenes dotted with shining papillæ.

Dry hills: St. Helena; Mt. Tamalpais and elsewhere in the western part of the state. May-June.

2. *F. Gallica* L. Five or 6 in. high; leaves mostly exceeding $\frac{1}{2}$ in., those involucre to the heads soft but straight and, in appearance, rigid; receptacle nearly flat; heads conical and somewhat 5-angled; marginal achenes completely enclosed in the at length indurated base of the bract.

St. Helena, *Jepson*, June, 1896. Introduced from Europe.

72. GNAPHALIUM L. CUDWEED.

Woolly herbs with entire sessile or decurrent leaves. Heads discoid, white, yellowish, or rose-tinted, disposed in panicles, corymbs, or spikes. Receptacle flat or convex, not chaffy. Bracts of involucre scarious, imbricated. Pistillate flowers in several series with filiform corollas. Central flowers perfect, with tubular 5-lobed corollas. Pappus a single series of capillary bristles. (Greek gnaphalon, a lock of wool, these plants floccose-woolly.)

A. Pappus-bristles united at base, falling away in a ring.

Inflorescence spike-like; leaves white-woolly beneath, green above

1. *G. purpureum*.

B. Pappus-bristles not united at base, falling separately.

Involucre imbedded in loose wool, its scarious-tipped bracts rather inconspicuous and dull colored; low branching annual. 2. *G. palustre*.

Involucre woolly only at base, its bracts mainly scarious or silvery.

Herbage in age becoming green (at least the upper surface of the leaves), more or less glandular.

Inflorescence corymbose; bracts pearly white; herbage balsamic-scented: var *Californicum* of 3. *G. decurrens*.

Inflorescence paniculate; bracts white or rose-tinged; herbage sweet-scented. 4. *G. ramosissimum*.

Herbage persistently woolly, not glandular or scarcely so.

Involucre bright white; inflorescence paniculate. . . 5. *G. microcephalum*.

Involucre greenish-yellowish, becoming rusty; heads in capitate clusters or the clusters somewhat open-paniculate. 6. *G. Chilense*.

1. *G. purpureum* L. PURPLE CUDWEED. Stems commonly simple and erect from a slightly decumbent base, 4 to 12 in. high; herbage canescent with a close dense coating of white wool, the upper surface of the leaves usually early glabrate; leaves broadly spatulate, obtuse, 1 to 2 in. long and 7 lines wide or less; heads crowded in a spike-like inflorescence which is dense and oblong, or more elongated and more or less interrupted; heads 2 lines long; involucre brownish or purplish; achenes sparsely scabrous.

Open ground, frequent: Napa City; Sausalito; Fish Ranch, Contra Costa Co.; Berkeley; San Francisco; Sierra Nevada.

2. *G. palustre* Nutt. LOWLAND CUDWEED. Annual, branching from the base, 3 to 8 in. high, erect or ascending; herbage loosely floccose with long wool, more or less deciduous from the leaves; leaves nearly all spatulate, or a few about the clusters of heads oblong or lanceolate, less than $\frac{1}{2}$ in. to 1 in. long; heads in small clusters at the ends of the branches, 1 to $1\frac{1}{2}$ lines high; bracts of the involucre linear, with white obtuse often denticulate tips.

Common in stream beds and low lands: Lake Co.; Russian River; Sonoma; Napa River; Howell Mountain; San Francisco; Oakland; Mt. Diablo; Sacramento Valley; San Joaquin Valley; Sierra Nevada; Southern California.

Var. *nanum*. Dwarf, 1 to $2\frac{1}{2}$ in. high; bracts acute.—Dry wooded hills, in open places: St. Helena, June 2, 1896.

3. *G. decurrens* Ives var. *Californicum* Gray. CALIFORNIA EVERLASTING. Biennial; stem stoutish, 2 or 3 ft. high, corymbosely branched at summit, the branches bearing glomerules of large heads and forming a broad and somewhat flat-topped inflorescence; herbage soon becoming green and more or less glabrate (except on the under surface of the leaves), at maturity glandular and balsamic-scented; lower leaves oblong ($\frac{1}{3}$ to 1 in. broad, and 2 to 5 in. long), diminishing in size upwards and becoming lanceolate, all obviously decurrent; heads roundish or broad, 3 lines high or slightly more, the involucral bracts white or in age rusty-tinged.

Dry wooded hills of the Coast Ranges: Lake Co.; Howell Mountain; Oakland Hills and southward to Southern California. May–July.

4. *G. ramosissimum* Nutt. PINK EVERLASTING. Biennial, 2 to 5 ft. high, the stems one to several from the base, ending above in a much branched panicle which is often narrow and sometimes virgate and frequently more than 1 ft. long; herbage glandular and very sweet-scented; leaves at length green on both faces, the stem more or less arachnoid; heads narrowly ovate or turbinate, 2 lines high, reddish or pinkish.

Wooded hills near the coast: Mt. Tamalpais; Oakland Hills and southward to Southern California, also in the Sierra Nevada. July–Sept.

5. *G. microcephalum* Nutt. SMALL-HEADED EVERLASTING. Stems often several from the base ($1\frac{1}{4}$ to $2\frac{1}{4}$ feet high) branching above

into an elongated or sometimes broad panicle; herbage very bright white woolly, especially when young, the wool persistent; panicle often 1 ft. long; heads small, narrow, 2 lines long, disposed in rather small glomerules or clusters at the ends of the branches of the panicle; bracts of the involucre ovate or oblong and obtuse at apex, or the very innermost linear, bright white.

Wooded mountain slopes: Coast Ranges; Sierra Nevada. Aug.—Sept.

6. **G. Chilense** Spreng. COTTON-BATTING PLANT. Annual or biennial; stems several, erect from a decumbent base (or single and wholly erect), stout, $\frac{1}{2}$ to $2\frac{1}{2}$ ft. high, often densely clothed with leaves; leaves narrowly spatulate (2 to 6 lines broad) or the uppermost linear or lanceolate, the short decurrent bases rather broad and somewhat auricle-like; heads 3 lines wide and high, numerous in a large close glomerule terminating the main stem, or in several glomerules at the ends of the branches of the more or less open panicle; involucre with a greenish-yellowish tinge.—(*G. Sprengelii* H. & A.)

Open ground in valleys or on low hills: San Francisco; Monterey and southward to Southern California.

73. **ANAPHALIS** DC. EVERLASTING.

Perennial herbs with simple erect equably leafy stems. Leaves green above, closely woolly beneath. Heads disposed in a compound corymb. Bracts of the involucre numerous, pearly white and scarious, imbricated in several series, radiating in age. Flowers yellow, dioecious:—staminate flowers with slender corolla and undivided style; pistillate flowers with a tubular 5-toothed corolla and 2-cleft style. Pappus as in *Gnaphalium*. (Ancient Greek name of some "Everlasting.")

1. **A. margaritacea** (L.) B. & H. PEARLY EVERLASTING. Stems several from the base, 1 to 2 ft. high; leaves broadly to narrowly lanceolate, sessile, with revolute margin, 3 to 5 in. long; corymb $1\frac{1}{2}$ to 6 in. broad.

Fields and open woods: Coast Ranges (Monterey, Mt. Tamalpais and northward); Sierra Nevada. July–Sept. Var. *occidentalis* Greene. Leaves sessile by a broad auriculate-clasping base.—Oakland Hills; San Francisco, etc.

74. **PLUCHEA** Cass.

Leafy herbs with a strong odor of camphor. Heads numerous, clustered in corymb-like cymes, consisting of many purplish disk-flowers and no ray-flowers. Marginal flowers of the head pistillate and perfect, with tubular-filiform truncate corollas; central flowers few, perfect, but sterile, with tubular 5-cleft corollas. Involucre imbricated. Receptacle flat, naked. Achenes grooved. Pappus a single series of capillary bristles. (Named for the Abbe N. A. Pluche, amateur naturalist, of Paris.)

1. **P. camphorata** (L.) DC. SALT-MARSH FLEABANE. Annual: stems stoutish, erect, branching above, $1\frac{1}{4}$ to $2\frac{1}{2}$ ft. high; herbage glandular-puberulent; leaves oblong-ovate or lanceolate, glandular-dentate, short-petioled or the upper sessile, the larger 3 to 5 in. long; heads $2\frac{1}{2}$ lines high, rarely leafy-bracted, in corymb-like cymes; bracts of the involucre ovate-lanceolate; achenes pubescent.

Common in the salt marshes about Suisun (*Brewer, Jepson*) and San Francisco Bays, southward to Kern Lake (*Dary*) and Southern California.

75. **ADENOCAULON** Hook.

Perennial herbs. Stems slender, leafy only at the base, bearing above a panicle of small and few heads of whitish flowers, the upper portion of the stem and the panicle beset with small glands. Leaves alternate, broad, petioled, green and glabrous above, white-woolly beneath. Heads of few disk-flowers; ray-flowers none. Marginal flowers of the head pistillate and fertile, the central perfect, sterile and with undivided style; corollas of both sorts, tubular and alike. Bracts of the involucre 5, equal, in a single row, not scarious, reflexed in fruit, at length deciduous. Receptacle flat, naked. Mature achenes much elongated and clavate, covered above with stalked glands. Pappus none. (Greek adenos, a gland, and kaulon, a stem.)

1. **A. bicolor** Hook. Stems $1\frac{1}{2}$ to $2\frac{1}{4}$ ft. high, the lower portion floccose-woolly; leaves deltoid-ovate, cordate at the base, sinuate-dentate, $1\frac{1}{2}$ to mostly 3 or 4 in. long and as broad or broader; petioles margined; achenes 3 to $3\frac{1}{2}$ lines long, much longer than bracts of the involucre.

Woods of the seaward and middle Coast Ranges and of the Sierra Nevada. June.

TRIBE 10. **Astereæ.** ASTER TRIBE.

76. **GUTIERREZIA** Lag.

Herbaceous or suffrutescent, the herbage resin-bearing, nearly glabrous. Leaves narrowly linear, entire, alternate. Heads very small, turbinate-oblong to campanulate, numerous and corymbosely arranged at the summit of the stems and branches. Bracts of the involucre coriaceous, the outer shorter. Receptacle in ours flat. Flowers yellow; rays short, in ours 8 to 10. Achenes angled or striate, mostly silky. Pappus paleaceous. (Name of a noble Spanish family.)

1. **G. Californica** (DC.) T. & G. Plants 1 to $1\frac{1}{2}$ ft. high, the woody base much branched; leaves scabrous; heads fastigiately corymbose, 2 to 3 lines high; rays 8 to 10; disk-flowers 6 to 11; achenes densely silky; pappus of about 12 unequal paleæ.

Dry hills of the South Coast Ranges towards the coast.

77. **GRINDELIA** Willd. GUM PLANT.

Coarse perennial herbs or suffrutescent plants. Leaves obovate or spatulate to oblong-lanceolate, commonly serrate. Heads gummy, medium-sized or large, solitary on the branches, ours with rays. Involucre campanulate or hemispherical, the bracts many-ranked, firm-herbaceous, often with attenuate squarrose points. Achenes short, truncate, compressed or turgid, glabrous. Pappus of 2 to 8 very readily deciduous awns or small scales. Involucral cups of the budding heads completely filled with the white or cream-like gummy exudation. (Hieronymus Grindel, Russian botanist, professor at Riga and Dorpat.)

Species of the Coast Range hills and valleys and interior plains; rays light orange or yellow.

Involucre mostly hemispherical, about $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter.

Its bracts linear-lanceolate, closely compacted, as in all the following except the next, and with few or several accessory foliaceous bracts; these unequal and often deflexed: var. *maritima* of . . . 1. *G. robusta*.

Involucre wholly or largely foliaceous, of loose broad erect subequal bracts, not glutinous-compacted: var. *patens* of . . . 1. *G. robusta*.

Involucre without accessory foliaceous bracts, very glutinous, the bracts with spreading tips: var. *Davyi* of 1. *G. robusta*.

Involucre urnshaped-campanulate, about $\frac{1}{2}$ in. in diameter; bracts linear-lanceolate or subulate, outer or all squarrose. . . 2. *G. camporum*.

Involucre small; bracts lanceolate, erect 3. *G. rubricaulis*.
Species of salt marshes; rays golden yellow 4. *G. cuneifolia*.

1. ***G. robusta*** Nutt. var. *maritima*. Stems ascending or erect, about 1 to $1\frac{1}{2}$ ft. high; herbage lightly pubescent; leaves narrowly or broadly oblong, in a few cases wider above, obtuse, or mostly acute, more or less serrulate; involucre $\frac{3}{4}$ in. broad or more, the broadly lanceolate bracts with erect or spreading tips; foliaceous bracts ovate to lanceolate or linear.

Along the seaboard: Olema; San Francisco; Pilarcitos. June-July. Foliaceous bracts very variable in shape and size, even on the same plant, always more numerous on the head terminating the main axis, few or sometimes none on the heads terminating branches. Includes *G. rubricaulis* DC. var. *maritima* Greene. There are transition forms to the next variety from the Santa Cruz Mountains and elsewhere.

Var. ***patens*** (*G. patens* Greene). Stems 1 to 2 ft. high, mostly simple or with few strict 1-headed branches; herbage glabrous or finely puberulent; leaves oblong, the radical narrowed to a petiole, $3\frac{1}{2}$ in. long or less, the cauline sessile, narrowed toward the base, serrate or often entire below the middle; bracts of the involucre wholly foliaceous, erect, nearly equal, linear or lanceolate, 1 or 2 lines broad, sometimes with an inner involucre of subulate or filiform bracts which are glutinous-compacted.—Hill tops, not common: Wild Cat Hills (near Berkeley) to the Santa Cruz Mountains west of Gilroy. There are many transitional forms to the next, but in its typical state this is an exceedingly well marked variety.

Var. ***Davyi***. Stems commonly clustered, erect, 2 ft. high, rarely simple, mostly with long one-headed branches; herbage glabrous,

rarely puberulent; darker green than in the next species; radical leaves oblong or even obovate, narrowed to a rather long, often winged petiole, serrate or coarsely and saliently toothed, 2 to 8 in. long, the cauline similar or sessile; heads naked; involucre $\frac{3}{4}$ to 1 in. broad, very gummy, its lanceolate bracts with subulate or filiform squarrose tips; achenes with 2 awns or in the periphery of the disk with 3 (2 at the exterior angle and closely approximate).—Valley lands about San Francisco Bay. Peduncles commonly less leafy than in the preceding variety. Heads typically naked, but frequently with a few loose outer and slightly larger bracts simulating the foliaceous bracts in the var. *patens*; or again, we may have still more pronounced intermediate forms closely connecting these two varieties, which in their typical states are very clearly marked. On the other hand, the var. *Davyi* presents perfectly naked (non-foliaceous) heads in such diversity that a complete chain may be had showing every gradation to *G. camporum*. *G. robusta* and its varieties in their extreme forms are more unlike each other than are the species *G. camporum* and *G. rubricaulis*. This is an excellent illustration of the principle that, in a highly variable group, varieties of a species may be more unlike than a species is unlike another species.

2. *G. camporum* Greene. Plants commonly $1\frac{1}{2}$ or 2 ft. high, glabrous, the foliage light green; leaves mostly oblong, serrulate or denticulate, 1 to 2 in. long; heads paniculate-corymbose, never solitary; involucre urnshaped-campanulate, the short outer bracts linear-subulate, squarrose-deflexed, the inner lanceolate-subulate, with spreading tips or erect.

Abundant on the plains of the San Joaquin and Sacramento Valleys and the dry inner Coast Ranges; also (apparently) Knoxville grade to Lower Lake. June–Aug. or continuing into the winter. Stems usually white, in no. 1 darker or reddish.

G. PROCERA Greene. Five ft. high; rays very short.—Flooded lands of the Lower San Joaquin; Greene also refers to this no. 2426, *Bolander*, of the State Survey, probably collected in marshes about San Francisco Bay, the citation, "Oakland Hills," in the State Survey Field Book doubtless an error.

3. *G. rubricaulis* DC. Stems commonly 2 ft. high, tufted, reddish or brownish, ending in a small corymb of about 3 or 4 heads or one-headed; herbage scantily soft-pubescent when young, in age mostly glabrous; leaves 2 to $5\frac{1}{2}$ in. long, oblong, serrate and sessile especially toward the apex, or disposed to be entire, attenuate into a petiole as long as the blade, the cauline similar or sessile; heads small, $\frac{1}{2}$ in. in diameter (not including the rays); involucre scales lanceolate, not squarrose, very slightly or not at all glutinous, sometimes tomentose.

Ridges and hillsides of the Coast Ranges, in openly wooded country: near Mt. Tamalpais, *Setchell*; Sonoma, *Bioletti*; St. Helena, *Greene*; Howell Mountain, *Jepson*.

4. *G. cuneifolia* Nutt. Stems 2 to $3\frac{1}{2}$ ft. high (commonly with a

foot or so woody at base), ending in a corymbose panicle of several heads or the simple sterile shoots densely leafy at summit; leaves thick, oblong or cuneate-oblong, 2 to 5 in. long, with broadly sessile or clasping base, those of the flowering branches much reduced, oblong-ovate, entire or serrulate; involucre bracts lanceolate without spreading tips.

Salt marshes about San Francisco, San Pablo and Suisun Bays. Aug.-Nov. Stems sometimes flexuous.

Var. **paludosa** (G. paludosa Greene). Five ft. high, with suffrutescent stems 1 to 2 ft. high lasting through the winter; cauline leaves sometimes triangular-oblong, with subauriculate clasping base.—Heart of the Suisun Marshes.

78. PENTACHÆTA Nutt.

Low and very slender annuals with narrowly linear and entire alternate leaves. Heads small, solitary, or somewhat clustered at the ends of more or less naked branches, nodding in the bud. Receptacle convex. Involucre turbinate-campanulate, its bracts in 2 series, narrowly oblong, thin or membranous, scarious-margined, mucronulate, appressed. Disk-corollas yellow or rose-red, very slender; rays white, pink or yellow, or none. Achenes oblong, flattened, hirsute-pubescent. Pappus of 5 slender bristles, often with 2 reduced or wanting, or all obsolete. (Greek pente, five, and chaite, a bristle, in allusion to the pappus.)

Simple or with simple branches from the base, erect; peduncles white-villous beneath the head 1. *P. exilis*.
Dichotomous, and disposed to be diffuse; peduncles with scattered hairs 2. *P. alsinoides*.

1. **P. exilis** Gray. Simple or mostly branched from the base, erect, commonly 3 or 4 in. high; herbage purplish; branches or stems terminated by a single head ($1\frac{1}{2}$ to 2 lines high); involucre broadly campanulate; rays 8 to 14, 2 lines long; outer disk-corollas rose-red, widening upward, the throat abruptly contracted beneath the minute teeth; achenes oblong-turbinate, villous; pappus-bristles 3 or 5, sometimes abortive.

Coast Range hillsides: San Mateo Co., Oakland Hills; Marin Co., Napa Valley. Apr.-May.

2. **P. alsinoides** Greene. Dichotomously branching, 2 to 5 in. high; involucre narrowly or broadly turbinate, its bracts 5 to 7 or 9 and containing 3 to 7 flowers; disk-corollas filiform, with minute teeth; rays none; achenes obovate-clavate; pappus-bristles 3, very slender.

Coast Ranges: Berkeley Hills, *Greene*; Vallejo; Sonoma. Also in the Sierra Nevada acc. to Gray. Apr.-May.

79. HETEROTHECA Cass.

Tall hairy herbs with alternate leaves and heads of yellow flowers in a terminal corymbose panicle. Involucre hemispherical or broadly campanulate, its narrow bracts closely imbricated in many series,

without spreading tips. Both ray- and disk-flowers numerous and fertile. Ray-achenes triangular-compressed; pappus none or caducous. Disk-achenes compressed, silky-hirsute; pappus double, the copious inner bristles long, capillary and scabrous, the outer of short and stout bristles or scales. (Greek heteros, different, and theke, a case or ovary, the achenes of disk and ray dissimilar.)

1. *H. grandiflora* Nutt. Mostly simple below, 2 to 5 ft. high; peduncles with gland-tipped hairs; leaves ovate, varying to elliptic or oblong, serrate, the lower and radical long-petioled, the upper sessile by a rather broad base; heads rather large (4 or 5 lines high); rays about 30; pappus as long or longer than the achene, in age brick-red; outer pappus of disk-flowers inconspicuous.

Immigrant from Southern California: San Jose, etc. Aug.-Oct.

80. CHRYSOPSIS Ell.

Perennial herbs, sometimes suffrutescent, with entire leaves. Heads medium-sized, solitary or paniculate. Rays present or none. Involucre campanulate to hemispherical, its bracts narrow and regularly imbricated. Flowers yellow. Style-appendages linear-filiform to subulate. Achenes compressed or turgid. Pappus brownish or ferruginous, of numerous capillary bristles, with or without a short outer row of little scales. † (Greek chrusos, golden, and opsis, aspect, from the color of the blossom.)

Heads with rays; corolla glabrous; outer pappus linear-squamellate: vars. of 1. *C. villosa*.
Heads rayless; corolla sparingly hirsute; outer pappus none. 2. *C. Oregana*.

1. *C. villosa* Nutt. var. *Bolanderi* Gray. Stems low, 3 to 12 in. high, rather stout, several from the woody base; herbage villous-pubescent and often scabrous, greenish or sometimes silky; leaves oblong-spatulate, mucronate, narrowed below to a distinct petiole or the upper sessile and less spatulate, or widest at the middle and tapering to both ends, mostly 1 in. long; heads 5 to 7 lines high, leafy-bracted, solitary or few in a corymbose cluster; involucre campanulate or cylindric-campanulate, its bracts lanceolate or subulate, villous-pubescent, in few ranks; rays 4 to 6 lines long; pappus-bristles minutely scabrous, in a single row; outer pappus of little scales; achene silky, $\frac{3}{4}$ line long.

Dry hillsides or rocky hilltops near the coast: San Bruno Hills; San Francisco; hills above Wild Cat Creek and northward to the ocean bluffs of Mendocino Co., where it occurs in typical form. Sept.

Var. *echioides* Gray (*C. echioides* Benth.). Stems rigid, erect, 10 to 16 in. or even $2\frac{1}{2}$ ft. high, usually suffrutescent at base; herbage dense, hirsute-canescens; leaves rigidulous, $\frac{1}{2}$ in. long, the lowermost longer; involucral bracts hispid-pubescent, the foliose bracts often hispid-ciliolate; pappus-bristles in a single row; outer pappus consisting of very short little scales, not concealed by the pubescence of the achene.—Dry ground: Weldon Cañon (Vaca Mountains), Jepson,

1887, and southward through the San Joaquin Valley and inner South Coast Ranges to San Diego Co.; also west to Saratoga (Santa Clara Co.), *Davy*, 1893. Sept.

Var. *sessiliflora* Gray (*C. sessiliflora* Nutt.). Stems few or several from a woody root, $1\frac{1}{2}$ to 2 ft. high, freely branching above, the heads 4 to 5 lines high and solitary, or 2 or 3 together at the ends of long branchlets; herbage hispid or villous-canescens or greenish, somewhat viscid; bracts sparsely hirsute, granulose-glandular; rays 3 or 4 lines long, corolla-tube 4-angled toward the base; slender little scales of the outer pappus often concealed by the densely villous hairs clothing the achene.—South Coast Ranges: Saratoga, *Davy*; rare within our limits, common southward.

2. *C. Oregana* Gray. About 2 ft. high, of low bushy habit, branching freely but the branchlets often long; herbage hirsute with spreading white hairs but the aspect green; leaves oblong to lanceolate, ascending, $\frac{3}{4}$ in. long, the netted veins purple under a lens; heads few or numerous, naked, the peduncles with 1 or 2 subulate bracts; bracts linear-lanceolate, in several series; corolla very slender, sparingly hirsute about the middle or on the lobes only; outer pappus none; achenes oblong.

Gravelly beds of streams in the Coast Ranges: Los Gatos, *Eastwood*; Sonoma, *Bioletti*; Putah Creek, *Woolsey* and *Jepson*, the plants hispid-scabrous, more densely branched, leaves on the branchlets mostly 3 lines long (doubtless var. *scaberrima* Gray); South Fork of Eel River, Lake Co. (in typical form), and northward, the northern plants typical. Aug.—Sept.

Var. *rudis*. (*C. rudis* Greene). Stems 8 to 12 in. high, arising from a stolon-like rootstock, simple below and bearing above a subcorymbose or paniculate cluster of heads; herbage hispid-pubescent or even canescens; leaves narrowly oblong, varying to lanceolate, acute or acuminate, cuspidate, the lower more often widest above the middle, $\frac{3}{4}$ in. long; involucre nearly or quite equaling the flowers, its bracts somewhat carinate or 1-nerved.—Sandstone beds of dry streams: Sulphur Spring Creek, Napa Valley. Sept.—Oct.

81. *STENOTUS* Nutt.

Suffrutescent or shrubby plants with glabrous herbage and evergreen foliage. Leaves alternate, narrow and entire. Heads large and broad, on solitary peduncles. Involucre hemispherical, its bracts little imbricated (in 2 or 3 series), membranous with scarious margins, closely appressed. Flowers yellow; rays several to many. Achenes oblong, somewhat compressed, densely villous. Pappus of slender bristles, permanently white. (Greek *stenotes*, narrowness, in reference to the leaves.)

1. *S. linearifolius* (DC.) Greene. Shrub 2 to 4 ft. high, with sticky herbage and stout woody branches; branchlets more or less fastigiate, leafy below, nearly naked above and bearing solitary heads; heads hemispherical, $1\frac{1}{2}$ to 2 in. broad, including the rays; leaves much crowded or fascicled, linear, narrowed toward the base,

$\frac{3}{4}$ to $1\frac{3}{4}$ in. long, 1 to $1\frac{1}{2}$ lines wide; bracts of the involucre in 2 or 3 rows, all nearly equaling the disk, oblong, acute, greenish, the inner with broad scarious fimbriolate margins; rays 13 to 18, oblong-lanceolate; disk-flowers numerous; achenes white-silky; pappus white, soft and deciduous.—(*Aplopappus linearifolius* DC.)

Mountain peaks and slopes: South Coast Ranges (Mt. Diablo southward to San Diego Co.); Sierra Nevada. Mar.—May.

PYRROCOMA ELATA Greene. Rigid perennial, with mostly radical leaves; heads in an interrupted spike or narrow panicle; bracts of the hemispherical involucre with squarrose green tips; achenes closely costate.—Saline soils, Calistoga and San Jose. Not seen by us.

82. **ERICAMERIA** Nutt.

Ours low evergreen shrubs or bush-like plants with narrowly linear or terete often heath-like leaves. Foliage punctate, resin-bearing. Flowers yellow, the heads in terminal corymbose or cymose clusters. Rays present or none. Involucre turbinate, its bracts chartaceous or coriaceous, regularly imbricated. Achenes more or less prismatic. Pappus-bristles slender, scabrous, dull white or yellowish, in age reddish. (Name from the resemblance of the minute evergreen leaves of the first species to *Erica*.)

Leaves terete, not viscid, imbricated on the short axillary branchlets; rays 5; coast plant . . . 1. *E. ericoides*.

Leaves narrowly linear, becoming filiform; rays none; montane plant . . . 2. *E. arborescens*.

1. ***E. ericoides*** (Less.) Nutt. Low heather-like shrub (1 to 2 ft. high) with decumbent or ascending main stems and numerous erect branchlets; leaves linear-terete, 1 to 2 lines long, crowded or fascicled; heads 3 to 4 lines high, numerous, corymbose-paniculate; bracts of involucre tomentose-ciliolate, the inner narrowly oblong, acute, the outermost lanceolate, acuminate; corolla with dilated throat; rays about 5, 2 lines long; achenes cylindric, striate, glabrous; pappus dull white, aging slightly brownish.—(*Aplopappus ericoides* H. & A.)

Sand dunes along the coast: Bolinas Bay; San Francisco; Santa Cruz and southward. Aug.—Sept.

2. ***E. arborescens*** (Gray) Greene. Erect, with fastigiate branches, 3 to 5 ft. high; leaves numerous on the branches, narrowly linear, or closely revolute and becoming filiform, resinous-punctate, $1\frac{1}{2}$ to 2 in. long; heads $2\frac{1}{2}$ to $3\frac{1}{2}$ lines high; bracts of the involucre lanceolate, acute, 2 lines long or less; rays none or rarely present; achenes canescent, somewhat quadrangular; pappus permanently dull white, its bristles unequal.—(*Bigelovia arborescens* Gray.)

Higher Coast Range hills, mostly from 1,000 to 2,000 ft. altitude, often occurring in chaparral or chamisal: Napa, Sonoma, Marin, and Contra Costa Cos., southward to the Santa Cruz Mountains. Also in the Sierra Nevada. Sept.—Nov.

83. **ISOCOMA** Nutt.

Rigid plants, somewhat woody at base, with thickish leaves.

Heads rayless, in a terminal corymbose cluster. Involucral bracts coriaceous, closely imbricated, the tips herbaceous, but appressed. Flowers yellow. Corolla-tube slender, the throat ventricose or obliquely dilated, its segments erect or more or less connivent about the style. Achenes longitudinally striate or ribbed, the intervals silky-pubescent or -hirsute. Pappus of numerous unequal bristles, the inner longest and often distinctly flattened. (Greek isos, equal, and koma, a tuft, the florets equal, not unequal as in *Lessingia*.)

1. *I. veneta* (Gray) var. *arguta*. Herbage with a rather close and somewhat glandular indument, the stems villous-tomentose below, tufted, erect and suffrutescent, 7 to 15 in. high; leaves broadly oblong in outline, serrate at apex, more deeply toothed at base, sessile, 1 in. long or less; heads in a dense terminal corymb, 4 to 5 lines high; bracts of the involucre obtusely acute; achenes 3-angled or somewhat flattened, pointed at base, rather less than 2 lines long; pappus of rather rigid and unequal bristles.—(*I. arguta* Greene. *Bigelovia veneta* Gray.)

Subsaline plains of the Lower Sacramento: Morning Light and base of the Pellejo Hills, Solano Co.

Var. *vernonioides* (*I. vernonioides* Nutt). Leaves entire, or serrulate at apex, and commonly with fascicled ones in the axils: Southern California; Upper San Joaquin Valley; introduced at Black Point, San Francisco.

84. *SOLIDAGO* L. GOLDEN ROD.

Perennial herbs with alternate leaves. Heads small, the raceme-like clusters aggregated in a pyramidal or spike-like panicle or thyrus, or in one of our species the heads corymbose. Bracts of the involucre narrow, thin or chartaceous, imbricated in 2 or more series. Both ray- and disk-flowers yellow. Pappus a single series of scabrous and mostly equal capillary bristles, usually dull white. Achenes terete or angular, 5 to 10-nerved. (Latin *solidus* and *ago*, to unite firmly, certain species reputed to have wound-healing properties.)

Stems freely branching, the flower-clusters more or less distinctly corymbose; leaves linear, entire. 1. *S. occidentalis*.

Stems simple; the flowers disposed in a terminal panicle.

Heads small ($1\frac{1}{2}$ to 3 lines high).

Panicle mostly pyramidal; leaves serrate or entire.

Herbage grayish. 2. *S. Californica*.

Herbage nearly glabrous 3. *S. elongata*.

Panicle narrow and virgate; herbage glabrous; leaves entire. 4. *S. sempervirens*.

Heads larger (4 lines high); heads in a spike-like thyrus; lower leaves spatulate, serrate towards the apex 5. *S. spathulata*.

1. *S. occidentalis* Nutt. WESTERN GOLDEN ROD. Stems 3 to 5 ft. high, very leafy, freely and paniculately branching, the branches terminated by more or less distinctly corymbose clusters of small heads; herbage glabrous; leaves linear or nearly so, entire, sprinkled with clear dots; heads 2 to $2\frac{1}{2}$ lines high; bracts of involucre chartaceous, linear-lanceolate; rays 16 to 20; disk-flowers 8 to 14; achenes turbinate.—(*Euthamia occidentalis* Nutt.)

Marshes, stream beds and river banks: Sierra Nevada; Sacramento and San Joaquin Valley; Coast Ranges; Southern California. Aug.-Oct.

2. **S. Californica** Nutt. COMMON GOLDEN ROD. Stem simple below the terminal panicle, 2 to 4 ft. high; herbage grayish with a minute rough pubescence; leaves oblong, acute at apex and tapering below into a short petiole, the lower varying to oblong-obovate and serrate, the upper smaller, narrow and entire; panicle usually compact, dense, not leafy, 4 to 13 in. long, made up of raceme-like clusters (or when elongated, secund), seldom recurved at tip, sometimes spreading in age; heads $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; bracts of the involucre oblong-linear or lanceolate, somewhat pubescent; rays 7 to 12, pale yellow, about as many as the disk-flowers; achenes pubescent.

Common on dry plains and hillsides or in the mountains throughout California. Sept.-Nov. "Orojo de Leabre" of the Spanish-Californians.

3. **S. elongata** Nutt. Stem about 3 ft. high; very leafy; leaves almost or quite glabrous, often bright green, oblanceolate, narrowed to a distinct petiole, broadly oblanceolate, sharply serrate, except at base, or entire; panicle dense, thyrses-like, the heads little if at all secund in the raceme-like clusters; heads small, 2 lines high or less; bracts of the involucre thin, linear; rays 10 to 16, narrow, usually more numerous than the disk-flowers.

San Francisco, Monterey, and doubtless elsewhere near the coast; Sierra Nevada. July-Aug.

4. **S. sempervirens** L. One to 3 ft. high or more, leafy to the top; herbage bright green, completely glabrous; leaves lanceolate or linear, somewhat firm and fleshy, the lowest varying to oblong-spatulate, all entire; heads 2 to 3 lines high, the raceme-like clusters collected in a dense narrow virgate panicle; bracts of involucre lanceolate or linear-lanceolate, acute or obtuse, scabrous-ciliolate; rays 7 to 10, large; achenes minutely pubescent.

Salt marshes, San Francisco Bay, *Bolander*. Rarely collected.

5. **S. spathulata** DC. COAST GOLDEN ROD. Stems 15 to 18 in. high, branched at base, decumbent, thickly clothed with broad leaf bases; herbage glabrous, slightly glutinous; leaves mostly basal, spatulate, rounded at apex, narrowed to a long marginal petiole, more or less serrate above the middle; heads 4 lines high, almost or quite as broad, the clusters aggregated in a single spike-like thyrsus terminating the simple stems; bracts of the involucre linear-oblong to oblong; rays about 7 or 8, inconspicuous, shorter than the disk; disk-flowers about 14 to 16.

Sandy hills near the coast: Point Reyes; Point Lobos; Mission Hills; Pajaro Hills and southward to Monterey where first collected by Hænke in 1791.

85. LESSINGIA Cham.

Annuals with alternate leaves, branching stems and commonly

panicled heads of yellow, purplish, lilac or white flowers. Heads rather small, campanulate to turbinate, usually narrow, 5 to 25-flowered. Bracts of the involucre imbricated in several appressed ranks. Receptacle flat. Flowers perfect. Corollas with linear lobes, or those of the marginal rows enlarged, more deeply cleft on the inside, and simulating a palmately lobed ligule. Achenes all fertile, turbinate or cuneate, more or less flattened, silky-villous. Pappus commonly of numerous unequal scabrous bristles, usually turning reddish brown. (Named for the Lessings, German family of scientists and authors.)

A. Flowers yellow; marginal corollas conspicuously larger; achenes flattened, 2 to 3-nerved.

Leaves of the branchlets scattered, not gland-bearing; seaboard species . . .

1. *L. Germanorum*.

Leaves of the branchlets small and crowded, the margin gland-bearing; mainly interior species, as all the following . . . 2. *L. glandulifera*.

B. Flowers purplish, lilac or white; corollas all alike or nearly so; achenes less flattened, 4 to 5-nerved.

Erect slender freely branching plants.

Pappus of slender bristles.

Wool deciduous in age.

Corollas short.

Heads terminating slender branchlets 3. *L. ramulosa*.

Heads more or less spicately sessile 4. *L. virgata*.

Corollas conspicuously exserted 5. *L. leptoclada*.

Wool more persistent in age 6. *L. hololeuca*.

Pappus of paleaceous bristles, some commonly more or less united; upper leaves ciliate-glandular 7. *L. adenophora*.

Depressed dwarfish plants; inner bracts of involucre pearly white and conspicuously awn-pointed 8. *L. nana*.

1. *L. Germanorum* Cham. Low, diffusely branched, 4 to 8 in. high; herbage with appressed white tomentum, wholly glabrate in age, at least on the branches; lowest leaves pinnatifid, those of the branchlets scattered, oblanceolate or linear and mostly entire; heads 21 to 25-flowered; involucre hemispherical, its bracts not glandular, with greenish tips or the outer wholly greenish; pappus-bristles about 35, 1 to $1\frac{1}{2}$ times as long as the achene.

Sandy hills along the coast: San Francisco, etc. Sept.-Oct.

2. *L. glandulifera* Gray. Stem erect, stoutish, paniculately very much branched, $1\frac{1}{2}$ to 3 ft. high; leaves ovate or oblanceolate, toothed or cleft, persistently woolly, those of the branchlets numerous and even crowded, green, minute, with the margin bearing yellowish glands; involucre campanulate, its bracts more or less gland-bearing; heads 18 to 38-flowered; pappus-bristles of disk-flowers as long as corolla, about 35; pappus-bristles of ray shorter than corolla.

Plains of the lower San Joaquin Valley (Lathrop) to Southern California. Aug.-Sept.

3. *L. ramulosa* Gray. Stems slender, 1 to $1\frac{1}{2}$ ft. high, loosely branching, granulose-glandular above or with minute tack-shaped glands; lowest leaves spatulate or oblong, denticulate or entire; upper lanceolate, mostly entire, those of the branchlets with partly clasp-

ing base; heads 7 to 8-flowered, 3 or 4 lines long, terminating diffuse slender branchlets; involucre turbinate or campanulate, 10 to 20 or 25-flowered; corollas short, purple; pappus-bristles longer than the achene, 20 or more, sometimes more or less coalescent at base into sets.

Dry hills of the North Coast Ranges: Mt. Tamalpais; Cordelia; Howell Mountain and northward. Sept.

4. *L. virgata* Gray. Stem and virgate branches rigid; herbage more densely woolly; upper leaves appressed, concave, carinately nerved; heads solitary and sessile in the axil of a leaf of nearly the same length, thus forming a somewhat spicate inflorescence; involucre cylindrical, woolly, 5 to 7-flowered.

Plains of the Sacramento.

5. *L. leptoclada* Gray. Simple below, branching above, 2 ft. high; lower leaves denticulate, those of the branchlets ovate or lanceolate with somewhat sagittately adnate base; branchlets virgate and almost filiform, bearing few or solitary heads; involucre turbinate; bracts in many ranks, greenish at tip and cuspidate; corollas conspicuously exserted.

San Mateo Co., and northward.

6. *L. hololeuca* Greene. Stem erect, with rigidly ascending branches, nearly 2 ft. high, the whole plant even to the involucre white-tomentose; leaves all entire, the basal ones spatulate and narrowed to a long petiole; cauline leaves oblong or ovate, sessile and almost cordately clasping; rameal ones small; all the leaves and the bracts of the involucre ending in a short spinescent tip; heads turbinate; corollas red-purple; pappus-bristles rufous.

Low hills of Sonoma Co., *Greene*. Too near *L. ramulosa*.

7. *L. adenophora* Greene. Repeatedly branched from the base, forming a densely bushy plant 1 ft. high or a little more; lower leaves round-ovate to oblong, somewhat cordately sessile, densely woolly above, glabrate beneath; margins of the leaves (particularly of the upper) densely beset with small stipitate glands; heads numerous, 7 to 10-flowered, on filiform branchlets; bracts of the narrowly campanulate or almost cylindrical involucre very acute, suberect, more or less glandular like the leaves, the inner chartaceous, purplish, bristle-pointed; corollas red-purple; pappus-bristles united into 4 to 7 paleaceous sets, each set composed of a single stout bristle or of 2 or 3 bristles, united for nearly their whole length, or only at base.

Mountains of the North Coast Ranges: northern Napa Co.; Lake Co.; Colusa Co., acc. to Gray. July-Aug.

8. *L. nana* Gray. Depressed, dwarfish, the whole plant densely tomentose with thick wool; stems 2 to 4 in. long, flowering from near the ground; heads 10 to 12-flowered and nearly $\frac{1}{2}$ in. long, subtended by oblong or lanceolate leaves; outer bracts of involucre linear-lanceolate, somewhat herbaceous; inner bracts pearly white, tapering into a long awn which conspicuously equals or exceeds the flowers and the dark red pappus; achenes very short and turgid.

Sandy plains and foothills on the eastern side of the Sacramento and San Joaquin Valleys. Aug.

86. **BELLIS** L. DAISY.

Low herbs with (in ours) radical leaves and solitary heads on scape-like peduncles. Disk yellow. Rays white, or tinged with pink. Involucre hemispherical, its bracts wholly herbaceous and green, equal, in 2 rows. Receptacle conical, destitute of bracts. Achenes flattened, without pappus. (Latin bellus, pretty.)

1. **B. perennis** L. Tufted perennial; leaves obovate, sparingly toothed, narrowed at base to a margined petiole, 1 to $1\frac{3}{4}$ in. long; peduncle about 4 in. high; rays about 50.

An occasional escape from gardens: Berkeley; Mill Valley.

87. **CORETHROGYNE** DC.

Perennial herbs, some resembling *Lessingia*, others *Aster*, but flowering in late spring or summer. Herbage whitened when young with a cotton-like tomentum, which is often deciduous in age. Heads solitary or corymbose or paniculate. Involucre hemispherical to turbinate, imbricated. Receptacle pitted. Ray-corollas ligulate, neutral. Style-appendages comose or with a bearded tuft. Achenes silky or pubescent. Pappus reddish brown, of rigid capillary bristles, present in the disk, reduced or none in the ray. (Greek korethron, besom, and gune, style, on account of the brush-like tuft of hairs on the style tips.)

Stem erect or ascending.

Heads in a panicle.

Heads on long corymbosely disposed peduncles. 1. *C. flaginifolia*.

Stems decumbent or prostrate; heads mostly solitary. 2. *C. viscidula*.

. 3. *C. Californica*.

1. **C. flaginifolia** Nutt. Two ft. high or more; tomentum floccose-deciduous; lower leaves $2\frac{1}{2}$ in. long, oblong-spatulate, narrowed to a slender petiole, passing into the upper small bract-like sessile ones, sparingly serrate towards the apex; heads turbinate-campanulate, 4 lines high, solitary and terminal on the branches or more numerous and loosely paniculate; rays violet.

Common at Monterey.

C. LEUCOPHYLLA Menzies. Small depressed persistently white-woolly plant; leaves numerous on the stems, $\frac{1}{2}$ in. long or less.—Sand dunes at Monterey.

2. **C. viscidula** Greene. Slender, loosely corymbose-panicled, 13 to 17 in. high; herbage hoary when young, becoming green and more or less glabrate; stems and both surfaces of the leaves glandular-scabrous; leaves oblanceolate, acute, serrulate, reticulate-venulose; heads 5 or 6 lines high, on rather long corymbosely disposed peduncles, these with short-stipitate glands; involucre hemispherical, its bracts rather strongly imbricated and also viscid-glandular; pappus light brown.

Monterey, *Parry*, 1888; Corallitos (Santa Cruz Co.), *Jepson*, 1896.

Var. **Greenei** (*C. Californica* Greene not DC.). Lanate or floccose tomentose, in age more or less glabrate, the peduncles and involucre glandular, the former with some stipitate glands as in the type; stems

tufted, erect or ascending, 1 ft. high; leaves spatulate-oblong or above linear, entire or serrate towards the apex, 1 to 1½ in. long; rays violet-purple; pappus rusty-brown.

Dry cañons of Contra Costa and Alameda Cos.: Niles, etc. June-Aug. The species is greener and more obviously "glandular-scabrous." The "reticulate-venulose" character assigned to the species can be made out beneath the tomentum in some specimens of the variety.

3. **C. Californica** DC. Plant white-woolly, with solitary heads on scape-like peduncles from prostrate or decumbent almost matted stems; involucre and summit of peduncle viscidulous-glandular; leaves spatulate or obovate, narrowed to a distinct petiole, entire or serrate towards the apex, 2 in. long or less; heads 4 or 5 lines high, 6 or 7 lines broad; rays deep purple; involucre and rays similar to the last.—(*C. cæspitosa* Greene.)

Crystal Springs, San Mateo Co., the only locality known to us. Apr. 15–June.

Var. **obovata** (*C. obovata* Benth.). Stems decumbent, 1 to 2 ft. long; herbage tomentose; leaves obovate-spatulate, toothed near the apex; heads 6 to 7 lines high, sometimes nearly 1 in. broad, inclined to be solitary; involucre glandular; rays purple; pappus of ray of 1 or 2 to 6 bristles; pappus of disk-flowers about 35 bristles, the longest 3½ lines long.—Near the sea from Pt. Reyes and Bodega (Marin Co.) to Mendocino. July–Aug.

88. ASTER L. ASTER.

Late-æstival or autumnal herbs, with paniculate, corymbose, or racemose heads. Heads usually numerous. Involucre turbinate or campanulate to hemispherical, the bracts imbricated in several ranks, with green tips. Disk-flowers yellow, changing to purple or brown. Receptacle flat, pitted. Pappus copious, of simple capillary bristles. (Greek *astere*, a star, from the star-like heads of flowers.)

Perennial; rays conspicuous.

Inflorescence corymbose; leaves (at least some) elliptic-obovate 1. *A. radulinus*.

Inflorescence paniculate or racemose; leaves linear to lanceolate.

Inflorescence mostly condensed, the heads on very short branchlets; herbage cinerous (and the pubescence harsher than in the next) or almost glabrous; leaves purple-veined beneath . . . 2. *A. Menziesii*.

Inflorescence mostly loose, the heads or clusters of heads on long branchlets; herbage hirsute or villous-pubescent, or glabrous . . . 3. *A. Chilensis*.

Annual or biennial; inflorescence paniculate; rays inconspicuous 4. *A. exilis*.

1. **A. radulinus** Gray. BROAD-LEAVED ASTER. Five to 18 in., seldom 2 ft. high, scabrous-pubescent; leaves oval-obovate to oblong, 4 in. long or less, sharply serrate above the entire (often attenuate) base; heads mostly numerous (sometimes very few), corymbose, 5 to 6 lines high; involucre turbinate; bracts imbricated, the outer shorter, villous-puberulent; rays whitish, 3 to 5 lines long.

Dry hills, rather common: Monterey, acc. to Gray; Saratoga; Oak-

land Hills; Petrified Forest; Vaca Mountains; Blue Lakes, Lake Co.; Sierra Nevada. July-Sept.

2. **A. Menziesii** Lindl. PURPLE ASTER. Stems simple, commonly several from the woody root, $1\frac{1}{2}$ to 2 ft. high; herbage cinereous or almost glabrous, the foliage rough-pubescent; leaves linear to lanceolate, 1 to $2\frac{1}{2}$ in. long, purple-veined beneath, remotely serrate or entire, sessile, subcordate at base, those of the raceme or thyrsoid panicle much reduced, so that the inflorescence seems almost naked; heads 3 to 5 lines high on rigid erect branchlets; involucre hemispherical or broadly turbinate, the bracts linear-spatulate in several closely imbricated ranks, the green tips obtuse; rays violet or purple.

Low dry ground: Vacaville and southward to Southern California. Sept.-Nov. Apparently rare in our region.

3. **A. Chilensis** Nees. COMMON ASTER. Two to $3\frac{1}{2}$ ft. high, villous-pubescent or more or less glabrous; leaves lanceolate, sessile, 5 in. long or less, entire, above passing gradually into the bract-like ones of the inflorescence, the radical oblong-spatulate, remotely serrate and attenuate into a petiole, all commonly with scabrous-ciliolate margins; panicle of loose leafy racemes 6 in. long or more; heads 4 to 5 lines high; involucre bracts in several series, somewhat carinate, with green tips; rays white, lavender, or bluish, 4 to 6 lines long.

Wooded hillsides, dry banks of gulches or streams, or in moist situations in fields: the most common species of the Bay Region. Sept.-Nov. Passing on the one hand into the

Var. **lentus** (*A. lentus* Greene). Slender, 4 to 6 ft. high, slightly succulent, mostly glabrous; heads few and large; rays 7 to 9 lines long.—Very common and conspicuous in the Suisun Marshes.

A form abundant on the Lower Sacramento River has linear-falcate leaves (9 in. long or less), and mostly solitary rather large heads. Referred provisionally to *A. Douglasii* Lindl. in *Erythea*, i. 244. On the other hand the following varieties have smaller and fewer (sometimes solitary) heads with shorter rays than in the type, with the inflorescence disposed to be more cymose; leaves of the inflorescence mainly much reduced and the transition to the ordinary leaves more abrupt.

Var. **media**. Branchlets of the inflorescence rather divaricate, with many spatulate-oblong or oblong-lanceolate spreading leaves 2 to 3 lines long; heads few, those on the same branchlets maturing at very unequal periods.—Lower Sacramento, *Jepson*, and *Saratoga, Davy*. A form from Evergreen, Santa Clara Co., *Davy*, Sept. 26, 1893, in fl., doubtfully referred here, has a very leafy stem, similar branchlets, leaves 6 to 7 in. long, large solitary heads, and the bracts of the involucre in few ranks.

Var. **invenustus** (*A. invenustus* Greene). Herbage cinereous-pubescent; upper leaves and those of the inflorescence small; involucre bracts spatulate-linear, thickish, obtuse, in rather few ranks, almost wholly herbaceous; rays dull purplish.—Local form at *Calistoga, Greene*.

Var. **Sonomensis** (A. Sonomensis Greene). Scarcely distinct from the preceding variety; slender, 1 ft. high, more glabrous; leaves mainly radical, oblong-spatulate, attenuate into a petiole $\frac{1}{2}$ to as long as the blade, remotely serrate; cauline much reduced, sometimes petioled, linear to lanceolate, those of the cymose panicle subulate-lanceolate and closely ascending; heads solitary or few at the ends of the strict branchlets; rays light pink to bright purple.—Subsaline lands: Petaluma, *Davy*; Napa, *Jepson*.

4. **A. exilis** Ell. SLENDER ASTER. Erect, slender, glabrous, mostly with a rather narrow panicle; leaves linear, 2 to 4 in. long and 1 to 2 lines wide, or rarely some of the lower oblanceolate or oblong and 2 to 4 lines wide, entire, rarely serrate, those of the inflorescence lanceolate-subulate; heads 2 to 3 lines high; bracts linear, acute, herbaceous, scarious-margined; rays light pinkish purple, 2 lines long; pappus fine and soft.

Saline soil, not common: Tyler Island and New Town Landing (Lower Sacramento); Stockton; Alvarado. Sept.—Oct.

89. **ERIGERON L. FLEABANE.**

Perennial or biennial herbs with entire or toothed generally sessile leaves, and solitary or corymbose heads. Disk-flowers yellow; ray-flowers exceedingly numerous, pistillate, white or purple, the ligules almost filiform, or in some species wholly destitute of rays. Involucral bracts narrow, equal, little imbricated, seldom coriaceous or green-tipped. Receptacle flat or convex, naked. Achenes flattened, usually pubescent and nerved. Pappus more scanty and fragile than in *Aster*, often with a distinct short outer series. (Greek *eri*, early, and *geron*, an old man, "old man in spring.")

A. Rays present.

Annual; heads with inconspicuous rays not surpassing the disk.

1. *E. Canadensis*.

Perennials.

Rays numerous, often 100 or more.

Leaves mostly entire; stem very leafy at base, the cauline leaves much reduced; maritime. 2. *E. glaucus*.

Leaves serrate, the cauline less reduced. 3. *E. Philadelphicus*.

Rays conspicuous, about 30 to 40; stems very leafy; leaves linear or narrowly oblanceolate. 4. *E. foliosus*.

Rays filiform, comparatively few and inconspicuous; sparsely leafy; leaves filiform. 5. *E. Setchellii*.

B. Rays none.

Perennials; leaves narrow and less than 1 (or 2) in. long.

Stems decumbent; heads large, 6 to 8 lines broad. 6. *E. supplex*.

Stems erect; heads smaller, 4 to 6 lines broad.

Herbage glabrous; leaves filiform or narrowly linear.

7. *E. angustatus*.

Herbage yellowish green; leaves linear. 8. *E. inornatus*.

Herbage canescent or rough-pubescent; leaves linear to oblong, often narrowed at base. 9. *E. miser*.

1. **E. Canadensis** L. HORSEWEED. Stems simple, erect, 2 to 5 ft. high; herbage hispid with scattered hairs or nearly glabrous,

especially above; leaves linear to lanceolate, the lowest spatulate or narrowed to a petiole, 2 to 3 in. long; heads small ($1\frac{1}{2}$ to 2 lines high), very numerous in a dense panicle; rays very short and inconspicuous, white.

A naturalized weed very common in waste or half-cultivated lands, in late summer or autumn: North Coast Ranges and the Sacramento Valley southward to Southern California.

2. **E. glaucus** Ker. SEASIDE DAISY. Flowering stems erect, 4 to 8 (or 10) in. high, commonly one-headed, arising from a radical tuft of leaves crowning the fleshy caudex and often, also, from rosulate offsets terminating prostrate woody branches; stems pilose-pubescent, leaves finely puberulent, heads somewhat tomentose; leaves spatulate, obovate, entire, rarely with a small tooth on either side below the apex, 1 to 4 in. long; upper cauline small and scattered; heads large, $1\frac{1}{2}$ in. in diameter including the numerous rather broad lilac and violet rays.

Common on cliffs or sandy shores, near the sea only: coast of California. July-Aug.

3. **E. Philadelphicus** L. Skevish. Stem simple, 2 to 3 ft. high, branched only at or near the summit; herbage hispidly pubescent; leaves spatulate or obovate, serrate or coarsely few-toothed, the radical (including the long margined petioles) 5 to 11 in. long, the cauline with auriculate clasping base, 3 in. long, more or less; heads corymbose, commonly on rather long peduncles, $\frac{1}{2}$ to 1 in. in diameter; rays white or pink, numerous, narrow.

Along streamlets and by springy places in the hills and valleys: Coast Ranges and Sierra Nevada. Apr.-May.

4. **E. foliosus** Nutt. Stems many from the base, erect, simple, corymbosely branching above, 1 to $1\frac{3}{4}$ ft. high; leaves crowded on the stems, conspicuously reduced only on the branches of the inflorescence, scabrous-hispidulous, linear or lanceolate, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, 1 to 2 lines wide; heads rather few in an open terminal corymb, hemispherical, 10 to 11 lines broad, including the violet rays; rays about 30 to 40, 1 line wide; pappus coarse and rather short.

Common in the hill country: Marin Co. to the San Francisco Peninsula, Leona (Alameda Co.), Mt. Diablo and southward. June-Aug.

5. **E. Setchellii**. Stems smooth, $1\frac{1}{4}$ to 2 ft. high; herbage bright green, very brittle; leaves filiform, less than 1 in. long, muriculate-scabrous; heads hemispherical, 4 lines high, disposed in a rather broad proliferous corymb with a few subulate bracts at base; involucre inconspicuous, the subulate or lanceolate bracts unequal, the outer rough-hispid; rays light blue, about 25, filiform, 2 lines long; achenes glabrous.

Arid plains of the Lower San Joaquin, June 27, 1896, *Setchell* and *Jepson*.

6. **E. supplex** Gray. Stems decumbent or ascending, 4 to 8 in. high, terminated by a single broad short-peduncled head 4 to 6 lines

high; herbage sparingly hirsute-pubescent or almost glabrous, the involucre canescently hirsute; leaves oblong-spatulate to linear-lanceolate, 1 to 2 in. long; bracts of involucre equal, linear-lanceolate.

North Coast Ranges, rarely collected and apparently maritime: Gualala, Sonoma Co., *Bioletti*; Mendocino City, *Bolander*, no. 6484.

7. *E. angustatus* Greene. Stems several or many from a woody crown, 13 to 18 in. high; herbage glabrous throughout; leaves narrowly linear or filiform; heads solitary or in a corymbose panicle, subtended by a few subulate bracts; involucre turbinate, slightly glandular; achenes somewhat pubescent, much compressed and with a reddish thickened callous-margin.—(*E. inornatus* Gray var. *angustatus* Gray.)

Dry hills of the Coast Ranges: Mt. St. Helena (whence Greene's type); Epperson's, Lake Co.; first collected by Harford in Calaveras Valley, Alameda Co., 1878; depauperate forms 4 to 6 in. high with one-headed stems occur in Marin Co. on Mt. Tamalpais and at El Campo.

8. *E. inornatus* Gray. PINE ERIGERON. Stems simple, more or less clustered, 2 ft. high; herbage yellowish green, hispidly pubescent or glabrous; leaves linear, 1 to 2 $\frac{1}{4}$ in. long; heads 3 to 4 lines high, 10 to 20 in a depressed corymb; involucre campanulate; bracts unequal and somewhat imbricated.

Mountain ridges, common under Yellow Pine: North Coast Ranges (Cobb Mt., Lake Co., within a few miles of the Sonoma line); Sierra Nevada. July–Aug. Var. *VISCIDULUS* Gray. Lower, minutely and densely viscid-glandular; heads large and few.—Specimens from Gualala, Sonoma Co., are said to be this.

Var. *Biolettii*. Two ft. high, scabrous-puberulent; leaves oblanceolate, the margins obscurely hispid-ciliate.—*E. Biolettii* Greene, as to plants of Howell Mt.; the Hood's Peak plant not seen by us. Forms grading into the next are to be expected.

9. *E. miser* Gray. Stems in a rather close tuft on a short woody caudex, very leafy; herbage canescently hirsute; leaves linear-oblong, or cuneately narrowed towards the base, less than 1 in. long; heads 4 lines high, few in a rather close corymb; involucre campanulate, the bracts imbricated.

Rocky summits of the Coast Ranges from Mt. Hamilton and Wild Cat Creek to Mt. Tamalpais and Mt. St. Helena. July–Aug.

90. *BACCHARIS* L.

Perennials, ours shrubs excepting one, commonly resinous or glutinous. Heads many-flowered. Involucre imbricated. Flowers whitish or yellowish, diœcious. Staminate flowers with tubular corolla slightly dilated at the throat, the limb cleft into 5 linear lobes; ovary abortive; style present. Corolla of the pistillate flowers very slender and thread-like, obscurely toothed at apex, the teeth erect, not spreading. Pappus of capillary bristles in the sterile plant scanty and tortuous; in the fertile very long and copious. (The god Bacchus.)

Evergreen shrubs.

- Leaves obovate or cuneiform. 1. *B. pilularis*.
 Leaves lanceolate, willow-like. 2. *B. viminea*.
 Herbaceous perennial; herbage very glutinous. 3. *B. Douglasii*.

1. *B. pilularis* DC. Shrub, 2 to 5 ft. high; branchlets angular; leaves sessile; obovate or cuneiform, $\frac{1}{2}$ to 1 in. long, coarsely or sinuately few-toothed, or occasionally entire; heads 2 or 3 in the axils or several in a terminal cluster, short-cylindrical or ovoid, 2 or 3 lines long, the outer bracts broadly, the inner narrowly oblong, sometimes denticulate at apex; pappus of the pistillate flowers becoming 4 or 5 lines long, that of the staminate flowers dilated at apex into a lanceolate appendage.

Common in the Coast Ranges on low hills, high mountain slopes, or on the coast sand dunes (especially in a prostrate form), frequently gregarious: Southern California; Monterey; San Francisco; Alameda; Oakland Hills; Vaca Mountains.

2. *B. viminea* DC. MULE FAT. Distinctly shrubby, the stems loosely branching, very leafy, 5 to 7 ft. high; branches striate-angled; herbage scarcely glutinous; leaves lanceolate, acute at both ends, entire or sparingly denticulate, 1 to 3 in. long, very willow-like; heads 2 to 3 lines high, rather numerous in terminal corymbs or the clusters on short lateral branches and somewhat racemose; bracts of the involucre very thin, chartaceous, broadly lanceolate or the outer ones ovate, with scarios margins, erose and mostly villous-ciliate; receptacle flat; pappus of the fertile flowers of smooth bristles.

Stream-beds from the Feather River and Putah Creek to Napa Valley and southward through the Coast Ranges. July-Aug.

3. *B. Douglasii* DC. Stems suffrutescent at base, 4 to 5 ft. high, simple up to the terminal corymb; herbage very glutinous; leaves lanceolate and very acute, or the lower ovate-lanceolate, 3 to 4 in. long, serrulate, almost entire; heads numerous in a terminal compound almost naked corymb; bracts of the involucre linear or lanceolate-linear with greenish center, the scarios margins erose-ciliate; receptacle broadly conical; pappus of pistillate flower short and soft, of the staminate clavellate at summit.

Moist lowlands: abundant in the salt marshes about San Francisco Bay, thence southward to Southern California.

TRIBE 11. Eupatorieæ. EUPATORY TRIBE.

91. TRICHOCORONIS Gray.

Slender herb, the stems branching, weak or at base creeping. Leaves opposite, sessile. Flowers flesh-color, in slender peduncled heads terminating the branches. Receptacle convex, naked. Bracts of the involucre herbaceous or somewhat membranous, equal and nerveless, 12 to 18. Corolla abruptly much dilated above the narrow tube. Pappus of many small or minute paleæ and awns, forming a sort of crown. (Greek trichos, hair, and koronis, top.)

1. **T. Wrightii** Gray. Annual; stems assurgent, 6 to 9 in. high; leaves oblong or linear-lanceolate, remotely serrate or entire, auricled at base, $\frac{3}{4}$ in. long or less; heads 2 to $2\frac{1}{2}$ lines broad; achenes 4-angled, the angles hispidulous toward the summit; pappus of 4 barbellate bristles with an equal number of intervening but very small fimbriate paleæ.—(*Biolettia riparia* Greene.)

Lower San Joaquin River. Sept.

92. **COLEOSANTHUS** Cass. **BRICKELLIA**.

Perennial herbs or suffrutescent plants with alternate petioled leaves and white or whitish flowers in terminal or subterminal clusters of narrow heads. Involucre imbricated, its bracts striately nerved. Receptacle naked. Corolla slender, 5-toothed. Achenes with 10 nerves or ribs. Pappus of numerous scabrous or barbellate capillary bristles mostly in a single series. (Greek *koleos*, sheath, and *anthos*, flower.)

1. **C. Californicus** (T. & G.) O. Ktze. Stems many from the shrubby base, virgate or paniculately branching, 2 to 3 ft. high; leaves roundish or triangular-ovate, 3-ribbed and roughish, somewhat irregularly serrate, $2\frac{1}{4}$ in. long or less; heads spicate or racemose along the leafy branches, 5 or 6 lines long, 10 to 15-flowered, often more or less nodding; bracts of the involucre, especially the inner, with thin obtuse straight tips.—(*Brickellia Californica* T. & G.)

Gravelly stream beds of the Coast Ranges, especially toward the interior: Mendocino Co.; Calistoga; Vaca Mountains and southward to Southern California.

GLOSSARY OF TECHNICAL, TOPOGRAPHICAL, AND ECOLOGICAL TERMS.

- Acaulescent*, apparently stemless, the leaves borne at the surface of the ground and the flowers sessile or borne on a scape. (See *Caulescent*.)
- Accessory*, something additional.
- Accrescent*, increasing in size or length with age, as the calyx or pedicel after flowering.
- Acerose*, needle-shaped, like Pine leaves.
- Achene*, a dry indehiscent 1-seeded fruit.
- Acorn*, nut of the Oak.
- Acuminate*, tapering gradually to the apex.
- Acute*, with a sharp point.
- Adherent*, growing fast to or united with another body.
- Adnate*, growing fast to; literally, born united to another body.
- Alternate leaves or branches*, only one from each node.
- Ament*, a catkin or scaly spike, as in the Oaks or Alders.
- Amplexicaul leaf*, a sessile leaf with the base of the blade clasping the stem.
- Anastomosing*, said of veins, nerves or similar structures which run into each other or branch and tend to form a network.
- Andro-dioecious*, having flowers on one plant staminate, on another perfect.
- Androecium*, name for the whorl of stamens of a flower.
- Androgynous*, having both staminate and pistillate flowers in the same cluster.
- Andro-monoecious*, having perfect and staminate flowers on the same plant.
- Annual*, flowering and fruiting in the first year or season and then dying.
- Anterior*, the side in front; in an axillary flower, the side away from the axis; inferior.
- Anther*, the sac or sacs containing the pollen, the essential part of the stamen.
- Antheroid*, having something of the nature of an anther.
- Anthesis*, the period during which a flower is expanded, the stigma receptive and the anthers shedding pollen.
- Apetalous*, without petals.
- Apiculate*, ending in a short-pointed tip.
- Appendage*, any supplementary or superadded part.
- Appressed*, flattened or pressed against another body but not united with it; hairs lying flat on leaves are appressed.
- Aquatic*, living or growing in water; an "aquatic plant" may be wholly submersed or with only the base in water.
- Areola*, an area with a distinct or raised boundary, the spaces between the reticulations or veins: in *Compositæ* the disk or circle at the summit of the achene where sat the corolla.
- Aril*, an appendage of a seed growing at or about the hilum or summit of the funiculus.
- Arillate*, furnished with an aril.

- Aristate*, furnished with an arista or awn, like the beard or bristle of Barley.
- Articulated*, jointed or furnished with joints, where the stem separates or is inclined to do so.
- Ascending*, rising gradually upwards.
- Auriculate*, with ear-like lobes at the base.
- Awn*, bristle or beard of Barley.
- Awned*, provided with a Barley-like bristle.
- Axil*, the angle between a leaf and stem.
- Axile placenta*, a placenta borne on the axis of the ovary or fruit.
- Axillary*, borne or occurring in an axil.
- Axis*, the stem or longitudinal or central support on which parts or organs are arranged; a central line.
- Baccate*, of the nature of a berry, berry-like or pulpy.
- Banner*, the upper petal in a papilionaceous, or pea, flower.
- Barbellate*, bearing minute barb-like protuberances.
- Bay Region*, the area embraced by the counties bordering on San Francisco, San Pablo and Suisun Bays.
- Berry*, a fleshy indehiscent fruit, formed from a single superior or inferior ovary.
- Bi-*, a prefix to Latin words, two or twice.
- Bifid*, 2-cleft to the middle or thereabouts.
- Bilabiate*, a synsepalous calyx or sympetalous corolla cleft into two divisions: an upper (superior or posterior) lip; and a lower (inferior or anterior) lip; 2-lipped as the corolla of Sage or of Mimulus.
- Bipinnate*, twice pinnate.
- Bladdery*, thin and inflated.
- Blade*, the flat expanded portion of a leaf; said also of the broad portion of a petal, especially when it possesses a petiole-like base or claw.
- Bloom*, said when leaves and fruit are whitened with a fine powder or dust.
- Bract*, the modified leaves of a flower-cluster; in Gramineæ, the modified leaves subtending a spikelet; leafy-bracted, in Compositæ, with accessory or foliose bracts to the head outside the involucre.
- Bracteal*, of the nature of a bract.
- Bracteate*, possessing or bearing bracts.
- Bractlet*, the small modified leaf subtending a flower or inserted on the pedicel; in Gramineæ the lower of the two modified leaves subtending an individual flower.
- Caducous*, dropping off very early as compared with other parts; the calyx in the California Poppy falls when the flower opens.
- Cespitose*, said of stems when borne on the same stock in a close tuft.
- Calicine*, simulating a calyx or whorl of sepals.
- Calyculate*, said of the short bracts at the base of the proper bracts of the involucre in Compositæ imitating an exterior involucre.
- Calyx*, the outer, usually green, whorl of the flower.
- Campanulate*, bell-shaped.
- Canescent*, grayish white or hoary, the surface covered with fine white hairs.
- Capillary*, like a hair.

- Capitate*, gathered or collected into a head, or head-like.
- Capsule*, a dry dehiscent seed-vessel composed of more than one carpel.
- Carpel*, a simple pistil (which is typically 1-celled, with one placenta, one style, and one stigma), or one of the elements of a compound pistil; also applied to a simple pistil when mature or to one of the parts of a compound pistil which splits up when it is ripe.
- Carpophore*, the slender prolongation of the receptacle between the carpels in the Parsley Family.
- Cartilaginous*, firm and tough like cartilage.
- Catkin*, a scaly spike or ament, as in the Willow.
- Caudate*, bearing a slender tail-like body or appendage.
- Caulесcent*, having a distinct stem above ground; plants with radical leaves and flowers on a scape are not called caulescent.
- Cauline leaves*, leaves borne on a stem.
- Chamisal*, or *Chamiso* (pronounced Shámeez), collective term, including the gregarious individuals of *Adenostoma* and (strictly speaking) only *Adenostoma*.
- Chaparral*, collective term referring to the low shrubs which cover mountain slopes, plateaus, ridges or cañon sides, including particularly the *Manzanitas*, various species of *Ceanothus*, *Scrub Oak* and other species with rigid or thorny branches. See *Chamisal*.
- Chartaceous*, having the thickness or texture of writing paper; most leaves are chartaceous.
- Choripetalous*, petals distinct and free from each other; not united even at base.
- Chorisepalous*, sepals distinct and free from each other.
- Ciliate*, having the margin bordered with a row or rows of hairs.
- Circiniate*, rolled into a coil from the tip.
- Circumscissile*, splitting at the middle with the upper part falling away like a lid.
- Claw*, the narrow or petiole-like base of a petal, as in the Pinks.
- Cleft*, with sharp lobes.
- Coast Ranges*, the chains of mountains with north and south trend lying between the Pacific Ocean and the Sacramento and San Joaquin Valleys; North Coast Ranges, the ranges lying north of San Francisco Bay; South Coast Ranges, the ranges lying south of San Francisco Bay; inner Coast Ranges, the ranges bounding the great valleys on the west; inner North Coast Range, the Vaca Mountains and their northerly prolongation; inner South Coast Ranges, Mt. Diablo and Mt. Hamilton Ranges and southward; outer Coast Ranges, the ranges lying next to the Pacific Ocean; middle North Coast Ranges, the ranges lying between the inner and outer ranges, particularly the Napa Mountains and their northerly prolongation, the Mayacamas Range.
- Cochleate*, shell-shaped or spiral.
- Commissure*, the plane by which the flattened faces of the two carpels in *Umbelliferae* cohere.
- Commonly*, a species commonly has a certain character when the great majority of the indi-

- viduals met with display such a character. See Mostly.
- Complete flower*, one which has all the four circles, sepals, petals, stamens, and pistils.
- Compressed*, flattened on the sides or laterally: compressed pod in Cruciferae, flattened parallel to the partition; compressed achenes in Compositae, flattened contrary to the plane of the bract; compressed fruit in Umbelliferae, flattened parallel to the plane of the commissure. See Obcompressed.
- Concolorous*, of one color.
- Conduplicate*, folded flat, so that the folds or sides lie face to face.
- Convolute*, rolled inwards from one side to the other.
- Cordate*, heart-shaped with the notch at the base.
- Coriaceous*, leathery in texture and stiffness.
- Corolla*, the circle of petals in a flower, found outside the stamens and within the calyx.
- Corymb*, pedicels of unequal length, the lower longer so as to form a flat cluster.
- Cremocarp*, the fruit of Umbelliferae, composed of two achene-like carpels joined together by their flattened faces but which at maturity separate.
- Crenate*, with rounded or blunt teeth.
- Cuspidate*, tipped with a cusp or short hard point.
- Deciduous*, falling when ripe or after the function has been performed; a corolla is deciduous when it falls after anthesis; deciduous trees shed their leaves in autumn.
- Decomound*, several times compounded.
- Decumbent*, lying on the ground but tending to rise at the summit.
- Decurrent*, where the edge of the leaf runs down on the stem forming lines or wings.
- Decussate leaves or branches*, opposite but each pair placed at right angles or over the intervals of the pair above or below.
- Dentate*, toothed with the teeth standing directly outward.
- Denticulate*, dentate with fine teeth.
- Di-*, a prefix to Greek words, two or twice.
- Diadelphous*, stamens united into two sets.
- Dichotomous*, branching or forking with the two divisions nearly equal.
- Dilated*, widened or broadened, applied to flattened or wing-like structures.
- Dimorphic*, of two kinds differing in structure.
- Diœcious*, with stamens and pistils in different flowers on different plants.
- Dissected*, several times cleft into small segments.
- Distichous*, in 2 ranks or rows.
- Distinct*, parts in the same circle, not united; as "stamens distinct," separate from each other.
- Divided*, cleft quite to the base, or to midrib.
- Dorsal*, relating to or borne along the back.
- Emarginate*, with a sharp notch.
- Emersed*, growing up out of or raised above the water.
- Endosperm*, starch or other reserved food stored with the embryo in the seed.
- Entire*, margin not toothed or indented.
- Equilateral*, equal sided, or with the same number of parts on

- a side; a pinnate leaf is equilateral when it has the same number of leaflets on each side of the rachis.
- Equitant*, astride, as if riding, like the leaves of Iris.
- Eralescent*, disappearing or falling away very early.
- Exserted*, protruding beyond the surrounding organ; exserted stamens protrude beyond the corolla.
- Extorse*, turned outward.
- Falcate*, sickle-shaped.
- Fascicle*, a close cluster or bundle of roots, stems, leaves or flowers.
- Fenestrate*, with transparent areas or window-like openings.
- Fertile flower*, one which sets fruit containing good seed; fertile stamen, the anther containing pollen.
- Fid* or *fidus*, terminations meaning cleft or lobed, as 3-fid=3-cleft.
- Filament*, a thread, in case of a stamen the stalk supporting the anther.
- Fimbriate*, fringed.
- Fimbrillate*, diminutive of fimbriate.
- Fistulous*, hollow.
- Flabellate*, fan-shaped.
- Flexuous*, more or less zigzag.
- Floccose*, bearing locks or tufts of hair or wool.
- Foliaceous*, leaf-like.
- Foliolate*, having leaflets; 3-foliate, with 3 leaflets, etc.
- Follicle*, a dehiscent seed-vessel derived from a single carpel, as a pod of the Larkspur.
- Free*, not united to another organ, especially when one circle of the flower is not united to another circle.
- Fruit*, the matured or ripened ovary with all its appendages or accessory parts as well as contents.
- Fugacious*, very promptly falling off or lasting but a short time.
- Funiculus*, the stalk on which the ovule is borne in the ovary.
- Fusiform*, thickest at or above or below the middle and tapering more or less to each end.
- Galea*, the long or helmet-like upper lip in the Mint and Figwort Families.
- Galeate*, having a galea.
- Geminate*, twin, in pairs, two side by side.
- Geniculate*, bent abruptly, like a knee.
- Gibbous*, swollen or distended on one side.
- Glabrate*, becoming glabrous.
- Glabrous*, bald, not hairy.
- Glandular*, bearing glands, or having a surface which exudes a sticky or viscid liquid.
- Glaucous*, somewhat glaucous or becoming so.
- Glaucous*, whitened with a bloom.
- Glochidiate*, bearing bristles barbed at the tip.
- Glomerate*, compacted into a close cluster.
- Glomerule*, a compacted or condensed head-like cyme.
- Glumaceous*, like the glume (bract) of grasses.
- Glutinous*, with a sticky exudation.
- Granulate*, bearing granules or grain-like bodies.
- Great Valley*, local name of the central Californian valley, including the Sacramento and San Joaquin.
- Gyno-diacious*, having flowers on one plant pistillate, on another perfect.
- Gynæcium*, the name for a pistil or whorl of pistils of a flower.

- Gyno-monoëcious*, having perfect and pistillate flowers on the same plant.
- Habit*, general aspect or hue of a plant, mode of growth.
- Halophyte*, a plant growing in salty soils or alkaline soils, mostly succulent plants with thick or small leaves; the Pickleweed, *Atriplex* and Kern Greasewood are typical halophytes.
- Head of flowers*, flowers in a globose cluster, being sessile and collected at the same point on the peduncle.
- Herb*, a plant without woody stem or parts, at least above-ground.
- Herbaceous*, like an herb in appearance or habit, or in texture or color, as herbaceous sepals, meaning green and leaf-like.
- Herbage*, the vegetative parts (stems and leaves) produced in the season, not including the flowers or fruit.
- Hermaphrodite*, having both pistils and stamens in the same flower.
- Heteromorphic*, of 2 or more different kinds.
- Hispid*, with stiff or rigid hairs.
- Hispidulous*, minutely hispid.
- Hooded*, said of an organ which is curved or concave at the top like a hood.
- Hyaline*, transparent, translucent.
- Hydrophyte*, a plant adapted to live in water or very wet soil, chiefly characterized by a thin epidermis, reduction or absence of roots and reduction of the vascular system as in the Pond Lilies, Pond Weeds and Duck Weeds, or by succulence as in Arrow Head, or by tall unbranched stems with narrowly linear leaves, or leafless as in the Bulrushes and Sedges.
- Hypogynous*, with the parts of the flower under or free from the pistil, inserted on the receptacle.
- Imbricate*, overlapping like the shingles on a roof so as to cover or break joints.
- Immersed*, growing wholly under water.
- Incised*, cleft or cut irregularly and sharply.
- Included*, not protruding beyond the surrounding organ; included stamens do not protrude beyond the corolla.
- Incomplete flower*, one which has not all of the four circles.
- Indefinite* (number), variable or uncertain in number, or numerous.
- Indehiscent*, said of fruits or pods which do not split by valves or pores.
- Indigenous*, native to the region.
- Indument*, with a close pubescence or coat of hairs.
- Indurated*, hardened or becoming tough.
- Inequilateral*, not equilateral.
- Inequilaterally distributed leaflets*, the number on the two sides of the rachis not equal.
- Inferior*, growing or placed below; inferior ovary, one more or less attached to or united with the calyx; inferior stamens or lip of corolla, *i.e.* with the stamens or lip on the lower side of the flower.
- Inflated*, distended or bladderly.
- Inflexed*, bent or turned abruptly inward.
- Inflorescence*, a flower-cluster, or in particular the mode of arrangement of the flowers.

- Innovations*, in Gramineæ, barren shoots.
- Inserted*, attached to or growing upon.
- Interior*, the region of the Great Californian Valley (Sacramento and San Joaquin); interior plains, the plains of the Sacramento and San Joaquin Valleys; interior hills, the foothills on the eastern and western sides of the Great Valley.
- Interior plants*, found away from the sea; usually meaning the great Californian Valley or further inland, or at least the inner Coast Ranges.
- Inter-node*, the portion of the stem between two nodes.
- Interrupted*, not continuous and regular.
- Introrse*, turned inward.
- Involucel*, a secondary involucre, as that of an umbellet; a circle of bractlets.
- Involucrate*, provided with an involucre.
- Involucre*, a circle of bracts subtending a flower cluster.
- Involute*, rolled inwards from both sides.
- Irregular*, the parts not of the same size and shape.
- Keel*, a longitudinal central ridge on the back of an organ, like the keel of a boat; the two lower petals of a pea-like flower which are joined into a keel-like body.
- Lacerated*, irregularly but not necessarily deeply cleft or torn.
- Laciniate*, cut or slashed into narrow divisions.
- Lamellate*, composed of thin plates.
- Lax*, loose.
- Leaflet*, one of the divisions of a compound leaf.
- Legume*, a 1-celled seed vessel, composed of a single carpel, which dehisces by both the ventral and dorsal suture into two valves.
- Lenticels*, roundish spots on young bark which function as stomata.
- Lenticular*, shaped like a lens.
- Ligneous*, hard and woody.
- Ligule*, strap-shaped body such as the ray in the Sunflower Family; in Gramineæ the exerted portion of the hyaline membrane lining the sheath.
- Limb*, a border, the spreading part of a sympetalous corolla.
- Line*, $\frac{1}{2}$ of an inch.
- Linear*, very narrow, with parallel sides; 4 or 5 times as long as broad, or more.
- Lip*, one of the two divisions of a bilabiate corolla or calyx. See Bilabiate.
- Littoral*, growing near or under the influence of the sea.
- Lobe*, a division of an organ, especially one which is rounded; leaf lobes are usually not deep; leaves may be lobed, parted or divided depending upon the depth of division. See Parted and Divided.
- Loculicidal*, a capsule splitting longitudinally into the backs of the cells.
- Lodicules in Gramineæ*, minute hyaline scale-like organs at the base of the stamens, whose function is the opening of the floral envelope at anthesis.
- Lyrate*, shaped like a lyre, the terminal lobe of the leaf large and rounded with the lower pairs smaller.
- Mammæform*, breast-shaped or bearing breast-shaped prominences.
- Marcescent*, withering but persistent, not falling off.

- Maritime*, growing on the sea-coast.
- Mealy*, as if covered with a fine meal.
- Membranous* or *membranaceous*, thin, soft, and more or less pliable like an animal membrane.
- Merica**rp*, one of the carpels or achene-like halves of a cremocarp, the fruit of the Parsley Family.
- Merous*, parts or members, used in compounds; as 5-merous, having 5 parts.
- Mesophyte*, a common type of plant growing under the most favorable conditions of soil and moisture, characterized as a whole by a lack of special adaptations and by a great and diverse development of the leaf surface; Maples, Alders, Oaks, Thorn Apples and Mustards are typical mesophytes.
- Monadelphous*, stamens united into one set.
- Moniliform*, like a necklace or string of beads.
- Monocephalous*, bearing a single head; said of a stem or peduncle, especially a naked one.
- Monœcious*, with stamens and pistils in separate flowers on the same plant.
- Montane*, of or growing in the mountains.
- Mostly*, used in describing characteristics of species in the sense of usually, but variable as to the individual; "leaflets mostly 5," *i. e.*, mostly 5 on the individual, but there may be more or less. See Commonly.
- Mucronate*, tipped with a mucro or sharp but rather soft point.
- Muricate*, bearing rough and rather sharp excrescences.
- Muriculate*, diminutive of muricate.
- Naked heads*, without foliaceous or other bracts surrounding or concealing the involucre or head; naked stems or scapes, leafless.
- Nate*, termination meaning divided, as 2-nate, 3-nate.
- Nerve*, simple or unbranched vein, or a slender rib.
- Neutral*, said of a flower having neither stamens nor pistils or at least without functional ones.
- Nigrescent*, becoming blackened.
- Node*, the place on a stem where a leaf is borne.
- Nut*, an indehiscent fruit with a hard firm wall, resulting from a compound ovary.
- Nutlet*, a diminutive nut, applied to a fruit derived from a simple ovary or to a compound ovary which splits up at maturity.
- Obcompressed*, flattened on the anterior and posterior sides or fore and aft, instead of laterally or sidewise; obcompressed pod in Cruciferae, flattened contrary to the partition.
- Obcordate*, inverted heart-shaped, with the notch at the apex.
- Oblique*, unequal sided, as in leaves which are larger on one side than the other.
- Oblong*, two or three times longer than broad and with nearly parallel sides, or somewhat tapering to each end from the middle.
- Obsolete*, imperfectly or scarcely at all developed, or abortive; *e. g.*, the lower lip of a calyx is obsolete when it is obscure or not very distinctly developed.

Obtuse, blunt or rounded.

One-sided raceme, with the flowers all turned to one side; one-sided fruit, unequal-sided, etc.

Opposite leaves or branches, two from each node, proceeding from opposite sides of the stem; "stamens opposite petals," when the stamen is set before the petal.

Orbicular, round or roundish.

Orthotropous ovule, a straight ovule, one not inverted on its stalk.

Palea, chaff-like pappus borne on the achenes of the Sunflower Family; in the Grass Family the upper of the two modified leaves subtending an individual flower.

Palmate leaf, with the leaflets all borne at the apex of the common petiole, or with the divisions or sinuses of the leaf pointing to the petiole.

Palmatifid, cleft so as to resemble the outstretched fingers of the hand.

Palustrine, living in a marsh or swamp.

Panicle, a compound flower cluster, a raceme or corymb which is compounded by branching.

Papillate, bearing minute nipple-shaped protuberances.

Pappus, the modified calyx-limb borne on the achenes of the Sunflower Family, usually occurring as bristles, naked or plumose hairs, scales or chaff.

Parietal placenta, a placenta borne on the wall of the ovary or fruit.

Parted, cleft nearly but not quite to the base, or to the midrib.

Pectinate, cleft into closely set divisions like the teeth of a comb.

Pedate, palmately divided with

the lateral divisions 2-cleft, thus resembling a bird's foot.

Pedicel, stalk or stem of a flower in a flower-cluster.

Pedicellate, having or possessing a small or short pedicel.

Peduncle, stalk or stem of a flower or flower-cluster.

Pedunculate, having a peduncle.

Peltate, round, with stalk or petiole attached on the under side at the middle.

Penicillate, with a tip or cluster of fine hairs or bristles.

Perfect, having both stamens and pistils in the same flower.

Perfoliate, where a stem seems to pass through or pierce a leaf.

Perianth, the floral envelopes consisting of calyx or corolla or both; applied here chiefly to those flowers in which there is no marked differentiation into calyx and corolla.

Perigynous, inserted on the calyx.

Persistent, falling away very tardily or not at all.

Personate, when the bilabiate corolla has a very prominent palate or elevation in the throat.

Petal, one of the parts or divisions of a corolla, usually colored.

Petiole, the stalk of a leaf.

Petiolule, the stalk of a leaflet.

Pinnate, with the leaflets arranged along each side of a common petiole.

Pinnatifid, cleft in a pinnate manner.

Pistillate, provided with a pistil or pistils.

Placenta, that particular portion of the ovary wall which bears the ovules; it is sometimes strongly differentiated.

Plane, flat and even, without elevations or depressions; here

- used especially as opposed to concave, convex, revolute, etc.
- Plumose*, finely and abundantly branched, like a plume.
- Polygamous*, having perfect, pistillate and staminate flowers on the same individuals (polygamo-monœcious) or on different individuals (polygamo-diœcious).
- Posterior*, the side behind, in an axillary flower the side next to the axis; superior.
- Prickly*, armed with prickles or short sharp hard outgrowths of the epidermis of leaves or stems.
- Prismatic*, shaped like a prism, with flat faces separated by angles.
- Proliferous*, bearing supplementary flowering branches or shoots from or near the summit or from the inflorescence, which surpass the stem or inflorescence.
- Prostrate*, lying close along the ground.
- Puberulent*, minutely pubescent.
- Pubescent*, clothed with hairs, especially soft or downy hairs.
- Pungent*, terminating in a rigid, sharp or prickly point.
- Pustulate*, dilated.
- Quinate*, borne in or divided into fives.
- Raceme*, a flower cluster in which the flowers are borne along the peduncle on pedicels of nearly equal length.
- Racemose*, like a raceme.
- Rachilla*, in Gramineæ, the axis of a spikelet, on which the bractlets and paleæ, with their enclosed flowers, are borne. See *Rachis*.
- Rachis*, the axis of a spike or raceme, the prolongation of the peduncle through the flower cluster; the axis or midrib of a compound leaf or prolongation of the petiole; in Gramineæ the main axis and branches of an inflorescence, on which the spikelets are borne. See *Rachilla*.
- Radiate*, in the Sunflower Family, the heads with ray-flowers or ligulate corollas.
- Radical*, leaves are called radical when inserted so closely to the base of the stem as to appear to come from the root; or when arising from a rootstock or other underground organ.
- Rameal leaves*, leaves borne on the branches.
- Ranks*, successive rows.
- Ray*, in the Parsley Family, one of the primary branches of an umbel; ray in the Sunflower Family, one of the marginal flowers bearing a ligulate corolla.
- Receptacle*, in a flower, that portion of the stem on which the sepals, petals, stamens and pistils are borne; receptacle of the inflorescence is the axis of such a dense cluster as a head in the Sunflower Family.
- Reflexed*, bent or turned downward.
- Refracted*, bent abruptly downward or backward from the base, as if broken, as a pedicel on its stem or peduncle.
- Regular*, the parts in circle having the same size and shape.
- Reniform*, kidney-shaped.
- Repand*, with slightly uneven margin.
- Reticulated*, with a network; netted.
- Retuse*, with a broad shallow notch.
- Revolute*, rolled backward from each side.
- Rib*, a primary vein of a leaf.

Rigidulous, somewhat rigid or stiff.

Rootstock, prostrate or underground root-like stem, sending up from season to season herbaceous shoots and bearing roots on the underside.

Rostrate, with a beak or spur; narrowed into a slender process.

Rosulate leaves, radical leaves spreading in a circle or rosette on the ground.

Rotate, wheel-shaped; spreading flat or horizontally and circular in outline.

Rudiment, an imperfectly developed organ, a vestige.

Rugose, having wrinkles.

Runcinate, sharply incised with the teeth or incisions turned downward.

Sagittate, shaped like an arrow-head.

Samara, an indehiscent winged fruit like the key of a maple.

Scabrid, slightly scabrous.

Scabrous, rough to the touch.

Scale, a small thin body, not at all or little green, commonly scabrous; in Gramineæ minute, hyaline, scale-like organs at the base of the stamens, whose function is the opening of the floral envelope at anthesis.

Scape, a leafless flower-bearing stem arising from the ground.

Scarious, thin, dry and not green.

Scorpid, said of a 1-sided inflorescence which is circinately coiled in the bud.

Scurf, small, bran-like scales on the stem or leaves.

Secund leaves or flowers, inserted on (or turned to) one side of the stem.

Sepal, a leaf or division of the calyx.

Septal, relating to a septum.

Septicidal, a capsule splitting between the partitions of the cells.

Septum, a partition in an ovary or fruit.

Sericeous, silky with straight soft hairs.

Series, successive rows.

Serrate, toothed or saw-like, with the teeth turned forward or upward.

Sessile leaf, leaf without a petiole and the blade seated directly on the stem; sessile ovary, one without a stipe.

Set, a cluster or collection of organs of the same kind; stamens may be disposed in several clusters or sets.

Setaceous, bristle-like.

Setose, beset with bristles.

Sheath, in Gramineæ, the basal portion of the leaf, which usually enwraps the stem.

Sheathing, where the base of the blade or expanded petiole completely encloses or sheathes the stem for some distance above the node.

Sierras, short phrase for Sierra Nevada Mountains, used not only in western botanical literature but also in the general literature and poetry of California.

Silicle, a short silique not much longer than wide.

Silique, a 2-celled capsule, several times longer than wide, the valves splitting from the bottom.

Simple, unbranched or without branches; leaves are simple when the blade is composed of one piece; simple pistil, of one carpel.

Sinuate, with a recessed margin.

Sinus, with a recess or indentation, literally a bay.

Smooth, not rough, opposed to scabrous, echinate, etc.

Sordid, of a dull or dirty hue.

Spadix, a spike with a fleshy axis.

Spathaceous, spathe-like.

Spathe, a bract enclosing a flower cluster.

Spicate, in the form of a spike.

Spike, a flower cluster in which the flowers are sessile and more or less densely arranged along the peduncle.

Spikelet, a secondary spike; the flower-cluster of Grasses.

Spine, a sharp-pointed hard woody organ.

Spinescent, ending in a spine or sharp rigid point.

Spinose, furnished with spines, as the involucre bracts in the head of a Thistle.

Spur, a slender and hollow extension or prolongation of some part of a flower, as the petal of a Columbine or calyx of a Larkspur.

Squamella, a diminutive scale.

Stalk of a leaf, the petiole.

Stamen, one of the male organs of the flower.

Staminate, provided with or containing stamens but no pistils; said of a flower or plant.

Staminodium, a sterile stamen, usually one in which the anther is wholly obsolete and the filament much developed or dilated.

Stellate, with rays like those of a star, star-shaped.

Sterile, barren; a stamen without anther or an anther without pollen; a flower without a pistil or with imperfect pistil; ovary without good ovules.

Stigma, the receptive part of the

style which secretes a sticky or viscid substance.

Stipe, stalk by which the ovary or fruit is raised above the receptacle.

Stipels, stipules of the leaflet.

Stipules, small supplementary organs or appendages of the leaf, borne in pairs at the base of the petiole.

Stoloniferous, bearing stolons.

Stoma, mouth-like opening, like the partly opened lips.

Stramineous, straw-like or straw-colored.

Striate, marked with longitudinal lines, grooves or ridges.

Strict, close or narrow, closely upright and straight, not spreading.

Strigose, with straight appressed hairs or bristles.

Strophiole, an appendage near the hilum of seeds, as in the Bean.

Style, the contracted or slender portion of a pistil between the ovary and stigma.

Stylopodium, the enlargement or disk-like expansion at the base of the style, as in Umbelliferae.

Sub-, prefix, meaning somewhat, or nearly or below, depending upon the context.

Submerged or *submersed*, growing under water.

Subulate, awl-shaped.

Succulent, juicy or fleshy.

Suffrutescent, somewhat woody at base, with a persistent woody portion above ground.

Suffruticose, somewhat shrubby or shrub-like.

Superior, growing or placed above; superior ovary, one free from the calyx; superior stamens or superior lip of corolla,

- the stamen or lip on the upper side.
- Symmetrical*, with the same number of parts in each circle of the flower throughout.
- Sympetalous*, petals more or less united into one piece, so that one can not be taken away from the rest without tearing.
- Synsepalous*, sepals more or less united.
- Taproot*, a single and often strong root descending perpendicularly into the earth.
- Teratological*, relating to monstrosities or malformations.
- Terete*, round.
- Ternate*, occurring or divided into threes.
- Throat*, the upper expanded portion or orifice of the corollatube.
- Thyrse*, a close or contracted ovate panicle.
- Thyrsoid*, resembling a thyrse.
- Tomentose*, covered with soft or woolly hairs.
- Trichotomous*, forking, with the three divisions from the same point and nearly equal.
- Trifid*, 3-cleft to the middle or somewhat more or less.
- Tripinnate*, thrice pinnate.
- Triquetrous*, 3-sided.
- Truncate*, cut off squarely at the end.
- Tuber*, a very much thickened fleshy and more or less rounded underground stem.
- Tuberous root*, when the root or its branches are thickened and fleshy.
- Tubular*, shaped like a tube or hollow cylinder.
- Tufted stems*, short, close, and several or many together from the same stock.
- Turbinate*, top-shaped.
- Turgid*, distended or inflated.
- Umbel*, branches nearly equal and proceeding from the same point, so as to form a flat-topped cluster.
- Umbellet*, one of the secondary umbels of a compound umbel.
- Umbilicate*, depressed in the center.
- Undulate*, with strongly wavy margin, so that the leaf is not flat.
- Unguiculate*, furnished with a claw.
- Unisexual*, flowers containing pistils only, or stamens only.
- Vein*, in a leaf, a branch of a secondary rib or nerve.
- Ventral*, relating to or borne on the face.
- Ventricose*, distended or swollen on one side and not on another.
- Versatile*, swinging, turning freely on its support.
- Vitiform leaves*, grape-vine-like.
- Xerophyte*, a plant adapted to live in dry soil, on the desert, in sand or on rocky ridges, chiefly characterized by great thickening of the epidermis, condensation of the plant body, or reduction of the leaf surface. Cactus, Nuttall's Ceanothus, Manzanita, and Pickeringia are typical xerophytes.

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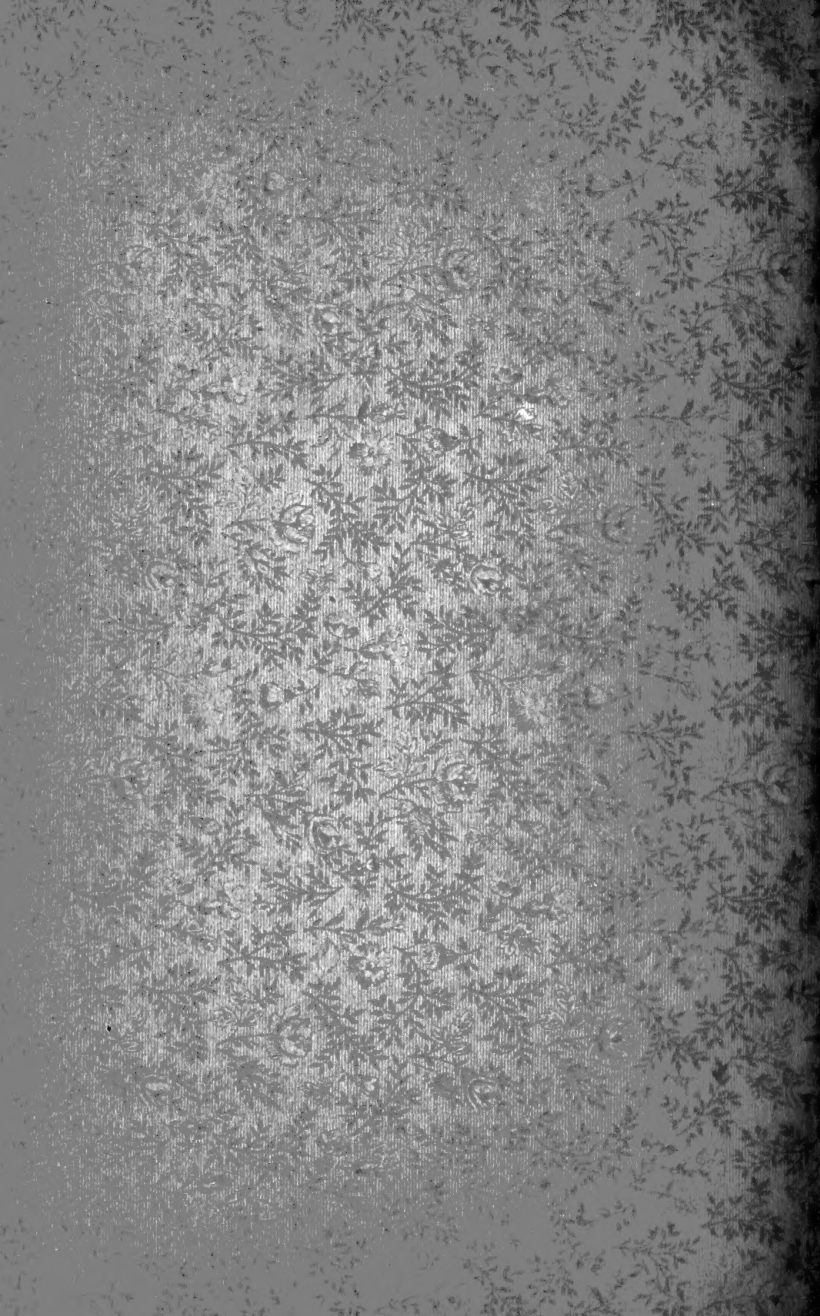
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